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SCIENTIFIC AND TECHNICAL INFORMATION

CAMERON STATION, ALEXANDRIA, VIRGINIA

FIRST QUARTER PROGRESS REPORT
ON

PRINTED CIRCUIT CONNECTORS
FOR

MICROASSEMBLIES

REPORT NO. 1

Period Covered by Report:	1 February 1963 to 1 May 1963
USAELRDL Contract No.:	DA-36-039-AMC-00122 (E)
Signal Corps Technical Requirement:	SCL-7673, 1 July 1962
Department of the Army Project No.:	3A99-15-005
Department of the Army Task No.:	3A99-15-005-03

SUBMITTED TO
U.S. ARMY ELECTRONICS RESEARCH AND DEVELOPMENT LABORATORY
FORT MONMOUTH, NEW JERSEY

SUBMITTED BY
CINCH MANUFACTURING COMPANY
DIVISION OF UNITED-CARR FASTENER CORPORATION
RESEARCH AND DEVELOPMENT DEPARTMENT
CHICAGO, ILLINOIS

PRINTED CIRCUIT CONNECTORS

FOR

MICROASSEMBLIES

First Quarter Progress Report

Report No. 1

1 February 1963 to 1 May 1963

The Program covered by this contract entails the development of microassembly connectors, specifically designated for use with hermetic and encapsulated microassemblies developed under Signal Corps Contract No. DA-36-039-SC-89176.

This program is made up of two tasks: Task A is a Development Program, to provide the design and development of a receptacle to mate with established hermetic microassembly pin terminations. Task B is a Feasibility Study of a printed circuit connector for an encapsulated microassembly of special design.

USAELRDL Contract No.:	DA-36-039-AMC-00122 (E)
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Written By:

HOWARD E. DWAN
Mechanical Engineer
Research and Development Department
Cinch Manufacturing Company
Chicago, Illinois

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LIST OF ILLUSTRATIONS

1.0 PURPOSE

The purpose of this contract is the investigation, design and development of printed circuit connectors, to be used as a means for connecting microassemblies into equipment of minimum possible size. The program covered by this contract comprises two parts hereafter referred to as Task A and Task B.

1.1 Objective

Task A Design, fabricate and evaluate a 20 contact receptacle. whose female contacts are capable of mating with 0.016 to 0.020 diameter microassembly pins.

The dimensions of the receptacle shall be such that the contacts can be mounted in an insulator body and onto a printed circuit board on a 0.075 grid. The maximum height of the receptacle shall not exceed 0.100 inches, excluding the contact tabs. The dimensions of the receptacle shall not exceed 0.393 by 0.393 inches.

Task B A Feasibility Study leading to the design of a printed circuit connector for an encapsulated microassembly of special design. Task B is divided into two phases, hereafter referred to as Phase 1 and Phase 2.

Phase 1 is concerned with the integration of a connector with a microassembly stack containing thirty-six (36) .010 X .002 conductor ribbons extending on 0.025 centers from the periphery of its base. The overall dimensions of the connector body are not to exceed 0.350 by 0.350 inches.

Phase 2 is concerned with the integration of a connector with a microassembly stack containing eighty (80) .010 X .002 conductor ribbons extending on 0.025 centers from the periphery of its base. The overall dimensions of the connector body are not to exceed 0.700 by 0.700 inches.

The contact tabs of the receptacle, shall be spaced on 0.050 centers and shall be contained within the area of the base. The maximum height of the mated halves in both Phases shall not exceed 0.100 inches excluding the contact tabs of the receptacle.

1.2 Related Projects

The following program is closely related to this contract:

Carr Fastener Company, Cambridge, Massachusetts a Division of United-Carr Fastener Corporation, is presently engaged in working with Hamilton Standard, Division of United Aircraft Corporation in the design and manufacture of a hermetic header to be attached to a microassembly stack or module. The work boing performed by Hamilton Standard relates to the same assembly for which this contract provides the connectors.

2.0 ABSTRACT

2.1 Task A - 20 Contact Microassembly Receptacle

During this period design effort was concentrated on a total of eleven (11) contact approaches to mate with 0.016" to 0.020" diameter microassembly pins. The contact designs were studied analytically and hand-made contacts of the most promising designs were fabricated and tested with regard to their retention characteristics. Six of the eleven contact designs were selected for further analysis.

2.2 Task B - Encapsulated Microassembly Connector

Analytical analyses of three connector design approaches for the 36 and 80 conductor encapsulated microassemblies were made during this period.

3.0 PUBLICATIONS, LECTURES, REPORTS AND CONFERENCES

3.1 Reports

Technical Progress Chart - Technical effort on development program for Printed Circuit Connectors for Microassemblies, Dated, 28 February 1963.

Progress Chart - Monthly expenditures of funds on development program for Printed Circuit Connectors for Microassemblies, Dated 28 February 1963.

3.2 Conferences

The first meeting was held on February 26, 1963 in the offices of the U.S. Signal Corps at Fort Monmouth, New Jersey.

Present

Mr. Roy Witte	-	Cinch Manufacturing Company
Mr. John Ralph	-	United Carr Fastener Corporation
Mr. Peter Byrne	-	Cinch Manufacturing Company
Mr. Sherman Bassler	-	U.S. Army Electronic R & D, Laboratory
Mr. Weldon Lane	-	U. S. Army Electronic R & D,Laboratory

The purpose of this meeting was to discuss generally provisions and requirements of the development contract covered by this report. The Signal Corps representative stated at this meeting the possibility of changing the number of contacts required in both tasks A and B.

A second meeting was held on April 10, 1963 at Fort Monmouth, New Jersey to discuss progress to date.

Present

Mr. Roy Witte	-	Cinch Manufacturing Company
Mr. Ben Johanson	-	Cinch Manufacturing Company
Mr. Peter Byrne	-	Cinch Manufacturing Company
Mr. Sherman Bassler	-	U.S. Army Electronic R & D,Laboratory
Mr. Weldon Lane	-	U.S. Army Electronic R & D,Laboratory

The proposed design approaches for Task A were examined and discussed and the following design decision arrived at:

The center of the module is to coincide with the center of the receptacle.

Every possible effort should be made to have the contact tabs in line with the header pins. Failing this, the contact tabs shall be located on a 25-Mil. grid pattern.

Three of the contact designs considered worthwhile and worthy of further investigation are (a) Approach A-5 (b) Approach A-9 (c) Approach A-2. At the request of Mr. Lane

sketches of these three contacts were sent to him.

The preliminary designs shall be further explored before testing on a full scale.

Suggested changes to Technical Requirement SCL-7673 covering Task A and Task B were advanced by the Army Signal Corps. These changes were discussed and mutually agreed upon. These were:

Task A - The number of contacts to be reduced from forty (40) to twenty (20).

Task B - Phase 1 The number of contacts increased from thirty-two (32) to thirty-six (36).

These changes were accomplished by an amendment to Technical Requirement SCL-7673, dated 8 March 1963, and sent to us.

4.0 FACTUAL DATA

4.1 Introduction

First Quarterly Report, covers the period February 1, 1963 to May 1, 1963. During this quarter, sketches, drawings, calculations and hand made samples were made in an effort to define the technical approaches and designs most applicable to the accomplishment of technical requirements for Tasks A and B.

4.2 Task A - Development and Evaluation of Design Approaches for a Female Contact to Mate with Established Hermetic Microassembly Pin Terminations

4.2.1 Equipment Used

1. Drop Weight - Graduated ounce weights
   (Graduated in ounces and gram increments)

2. Hunter Scale
   Manufacturer: Hunter Spring Company
   Lansdale, Pa.
   Model No.: LO-2-M

4.2.2. Results

Contact Approach A-1

Explanation

This particular contact was a redesign of a popular similar contact of Cinch Manufacture, which had been well received by our customers. It was felt that if we could retain the special features of the contact (such as long operating tines and therefore greater resiliency) and yet reduce the size to the Task A minimum requirement, it would work. However, upon redesign, it could not meet the minimum space requirement.

Results Discarded. (Ref.: FIG. 1 P.17)

Contact Approach A-2

Explanation

A similar contact had previously been used in an experimental project calling for a micro-miniature connector of comparable size. We felt that minor

changes in its geometry would result in a contact usable in an insulator body of one piece construction, thereby providing a desirable pin lead-in feature. This design was fabricated by three different methods, two of which proved feasible.

Results (Ref. TABLE 1 P.18 - FIG.2 P.19)

Fabricated using phosphor bronze grade A hard temper. Contact failed to hold minimum size pin after tests. The tests further showed satisfactory insertion and retention forces with the minimum and nominal size pin. A permanent set resulted with the insertion of the maximum size pin.

Approach A-2-1 (Modification of A-2)

Results (Ref. TABLE 2 P.20 - FIG.3 P.21)

This approach was fabricated with beryllium copper alloy 25, half-hard temper. The tests resulted in favorable insertion and retention forces as well as an ability to hold the minimum size pin.

Since the temper of the beryllium copper and that of the phosphor bronze material are similar, we cannot overlook the possibility that the hand forming of both contacts could be a resulting factor in the contact being able to hold the minimum size pin.

Approach A-2-2 (Modification of A-2)

Results (Ref: TABLE 3 P.22 - FIG. 4 P.23)

Fabricated using beryllium copper alloy 25 half-hard temper heat-treated to 700F for 30 minutes showed increasing ability thus greater reliability to hold the minimum size pin. Noticeable insertion forces greater than those of A-2-1 were observed.

Contract Approach A-3

Explanation

It is a unique combination of desirable features in a sheet metal contact, such as a restricted opening in the top of the contact prevents over sized probes or pins from entering. Bifurcation of the contact tines permits three point contact on the pin, a non-restrictive arrangement for the pin length.

Results (Ref: TABLE 4 P.24 - FIG. 5 P.25)

Fabricated using phosphor bronze spring temper. Preliminary tests showed failure of contact to hold minimum size pin. Due to the exceptional features, we will fabricate using beryllium copper material

and test the contact before making any decision.

Contact Approach A-4

Explanation

This contact features long operating tines and therefore greater resiliency, also bifurcation of the tines permitting a four point contact with the pin. As of this writing it has not been fabricated. Due to the small size, the major problem is that of cutting out the tail portion from the contact and forming such tail, without weakening the contact at its base.

Results Discarded (Ref: FIG. 6 P.26)

Contact Approach A-5

Explanation

This approach is a modification of a popular Cinch Screw-machine contact providing a means where the contact tab lines up with the center line of the contact.

Results (Ref. TABLE 5 P.27 - FIG. 7 P.28)

Fabricated using beryllium copper alloy 25 half-hard temper. The test resulted in the contact taking a set thus preventing it from holding the minimum size pin.

Approach A-5-1 (Modification of A-5)

Results (Ref: TABLE 6 P.29 - FIG. 8 P.30)

Modification to this design was the increased depth of cut on barrel. Results were somewhat better than those of Approach A-5, although it still would not hold the minimum size pin.
Note: (Same material as A-5)

Approach A-5-2 (Modification of A-5)

Results (Ref: TABLE 7 P.31 - FIG. 9 P.32)

Contact was fabricated using beryllium copper alloy 25 half-hard heat-treated material. Two cuts were made in the barrel resulting in four segments. A permanent set resulted in two of the four segments early in the test stage, thus

destroying the effectiveness of the contact. Probable reason for failure, segments too small and weak.

Approach A-5-3 (Modification of A-5)

Results (Ref: TABLE 8 P.33 - FIG. 10 P.34)

On this approach the barrel was lengthened and the slot cut deeper. Material used: beryllium copper alloy 25 half-hard heat-treated. Preliminary test results indicate the contact will hold the minimum size pin after sizing.

Preliminary evaluation on contact approach A-5 shows that barrel length and depth of cut, coupled with the heat-treated material provided a workable contact. Additional tests will be conducted to further evaluate the design.

Contact Approach A-6

Explanation

This approach is a modification of a Cinch fork-type contact. Miniaturized in past usage, it has proved reliable in related similar applications. Since approach A-6 and A-7 are very similar, we decided to proceed with Approach A-7.

Results Discarded (Ref: FIG. 11 P.35)

Contact Approach A-7

Explanation

This approach offered a miniaturized sheet metal contact with good contact bearing surface.

Result (Ref.: TABLE 9 P.36 - FIG. 12 P.37)

Fabricated using phosphor bronze grade A hard temper. Preliminary tests indicated inability of contact to hold minimum size pin. This contact is now being fabricated from beryllium copper material.

Contact Approach A-8

Explanation

The ability in drawing and forming from a piece of tubing was the reason for choosing this approach. After preliminary discussion on the design, it was decided that many problems would result from this method due to its miniaturized size.

Results Discarded (Ref.: FIG.13 P.38)

Contact Approach A-9

Explanation

Of all the contact approaches considered this appears thus far to be superior. The action of the contact in maintaining a suitable pressure against a mating pin, is of a cantilever type and controlled by the insulator cavity walls. By design the contact tines can be spread to the wall of the cavity prior to the material reaching its elastic limit. This of course, enhances the reliability of the contact when considering its susceptibility to damage due to mishandling. The contact is inserted into the cavity from the bottom. Two ears which are located on the top of the contact, spread out onto two shoulders of the insulator body, retaining the contact in the cavity. To minimize the effect of capillary action during the soldering process, the contact is indented across the folded tail to keep solder from flowing up into the pin area.

Another desirable feature is the restricted or closed entry arrangement in the top surface of the insulator body. This restriction prevents oversized probes or pins from entering, thereby reducing the potential damage due to mishandling. This restriction will also accurately control the pin alignment for engaging the contact.

Results Ref.: TABLE 10 P.39 - FIG.14 P.40 - FIG. 15 P.41)

Fabricated from beryllium copper alloy 25 half-hard temper. Has proved itself very reliable in preliminary tests.

Approach A-9-1 (Modification of A-9)

Results Ref: TABLE 11 P.42 - FIG.16 P.43 - FIG.17 P.44)

Very similar to A-9 with slight modifications as indicated by drawing. Has shown the same desirable qualities as that of A-9. Slight variation in insertion and retention forces.

Contact Approach A-10

Explanation

The desirability of this approach relates to our belief that it will provide a contact with long

operating tines and, therefore, the greatest resiliency. We plan to provide pre-tension in the contact utilizing either restrictive tines in the cavity opening, or having the tines of the contact pre-loaded against each other in such a way as to provide high pressure immediately upon entry of the male pin. It was hoped that we could design this contact for a one piece insulator body. After study and evaluation it appeared as though this could not be done. Since the technical requirement calls for a one piece construction, the approach was discarded.

Results Discarded (Ref.: FIG. 18 P.45)

Contact Approach A-11

Explanation

This approach is identical to Approach A-9 except modified to have contact tab and header pin on the same center line.

Results (Ref: FIG. 19 P.46)

At this writing the contact is being fabricated. The results should prove to be as favorable as those of Approach A-9.

4.3 Task B- A feasibility Study Leading to the Design of a Printed Circuit Connecto for an Encapsulated Microassembly

The basic design problem is (1) terminate the 0.002" X 0.010" conductor ribbons extending from the encapsulated microassembly into a male connector, and (2) design a receptacle which mates with the male connector and is compatible with mounting on a printed wiring board. The following design approaches were studied analytically this period.

4.3.1 Design Approaches

Design Approach B-1 (Ref: FIG. 20 P.47)

The attached drawing shows the basic layout of what the overall connector might look like, the cross-sections representing what will be fabricated on an experimental basis toward providing electrical contact. The intent here is to provide from the module, a series of contact ribbons, which, in themselves, would be permanently attached to an insulator base having an adequate lead-in so that entry to the connector receptacle would be easily permitted.

The female contact would be secured to its insulator and formed in such a way as to be required to flex upon engagement with the contact which is part of the male module package. In spite of the fact that this would represent probably the most conventional approach toward the solution of this problem, it is considered that this would be a very desirable starting point.

Design Approach B-2 (Ref: FIG. 21 P.48)

This approach, which is essentially very similar to B-1, has one basic difference in the fact that the receptacle contact is not required in itself to have the strength and accurate positioning required to make contact. To provide this feature, a suitable non-conductive external elastic member will be properly positioned in such a way as to cause the contact per so to be in an interference position with the male contact, so that upon mating the elastic member could be compressed and thereby be the vehicle for providing the pressure for electrical contact between the male and female members.

Design Approach B-3 (Ref: FIG. 22 P.49)

Approach B-3 provides another geometric view of the utilization of an independent external elastic contact pressuring member having the ability for greater flexure and quite possibly less contact insertion force than Approach B-2.

One additional feature of this approach is in the provision for greater engagement depth by the module into the receptacle and with it the inherent advantage of stability.

5.0 CONCLUSIONS

Task A

Tests have indicated that it is possible to provide a contact to accept a microassembly pin within the requirements of SCL-7673. Six of the approaches considered appear to have the capabilities of performing within the requirements and will be explored further. These are: A-2, A-3, A-5, A-7, A-9 and A-11.

Task B

The microassembly connector approaches B-1, B-2 and B-3 appear feasible. However, it is concluded from these studies that an approach wherein the male connector replaces the hermetic header in the microassembly stack is a more practical approach. Modification of the B-1, B-2 and B-3 as well as new design approaches will be pursued based on a header design compatible with electron beam welding in the microassembly stack (Ref. Final Report Contract #DA-36-039-SC-89176).

6.0 PROGRAM FOR NEXT INTERVAL:

Task A

Contact Approaches A-2, A-3, A-5, A-7, A-9 and A-11 will be further tested and evaluated. By the end of June all tested and supporting data will be reviewed and at this time we will finalize on three (3) contact approaches. During the month of July we will fabricate from temporary tooling, the three contact approaches selected. By the end of July all testing shall be completed on three approaches. From these tests one of the three shall be selected as the contact design, to fullfill the requirements covered in this contract, under Task A.

In conjunction with selecting a final contact approach, we will have established the following:

1. Header pin length and end configuration.

2. Plating specification for contacts

By this time samples will be available for visual observation.

Task B

The three approaches defined in section 4.3 as B-1, B-2, B-3 and other approaches will be considered and evaluated. Preliminary fabrication and tests will be performed to evaluate the feasibility of approaches considered.

7.0 IDENTIFICATION OF KEY PERSONNEL.-

During this quarter the following personnel took part in the work covered by this report.

NAME	TITLE	MAN HOURS
R. Witte	Project Director	*
B. Johanson	Technical Administrator	*
A. Van Keulen	Services Coordinator	*
R. Scott Modjeska	Physical Sciences Consultant	*
S. Majewski	Senior Engineer	176
H. Dwan	Mechanical Engineer	160
Model Makers		166
Laboratory Technicians		8

* R. Witte, B. Johanson, A. Van Keulen, R. Scott Modjeska do not charge directly to this project.

Key Personnel - Brief Statement of Technical Background.-

R. Witte - Project Director.-

Mr. Witte joined Cinch Manufacturing as Vice President of Research and Development in 1961. During his career he has held executive engineering positions in several companies since joining Ditto, Inc. in 1940. Among his more recent affiliations have been Link Belt Co., Motorola, Halicrafters and Magnecord. Before joining Cinch he served as Manager of Engineering for the Heydon Division of General Time Corporation. He holds a B.S.M.E. degree from Illinois Institute of Technology and is a member of the Institute of Radio Engineers, American Management Association and the American Society of Military Engineers. He is a registered professional engineer in the state of Illinois.

B. Johanson - Technical Administrator.-

Mr. Johanson joined Cinch Manufacturing Company in 1938. In his 24 years with Cinch he has worked directly as a designer of Electrical Sockets and Connectors and holds basic patents on many innovations on this type product. In the past ten years he has functioned as Chief Design Engineer of the Research and Development Department.

A. Van Keulen - Services Coordinator.-

Mr. Van Keulen received his B.S. degree from American Television Institute of Technology in 1949.

He has had 14 years experience in the Electronics Industry having spent the past 11 years in the R & D Department of Cinch Manufacturing Company. During this time he has served as Laboratory Supervisor and in the early part of 1961 was appointed Engineering Services Manager.

Mr. Van Keulen is active in EIA, having served as Secretary of the 08C Committee for 10 years, and is a member of the P-5.1 and P-5.2 Working Groups on Connectors and Sockets respectively.

He is a member of IRE and a United States Delegate in IEC.

He also presently serves as Chairman of EIA Task Group HR-21097 which is engaged in the formulation of established reliability methods in Military Specifications in accordance with the PSMR-1 recommendations to the Department of Defense. (Darnell Report).

R. Scott Modjeska - Physical Sciences Consultant.-

Prior to joining Cinch, Mr. Modjeska was Technical Director of Scientific Control Laboratories. He is recognized as a pioneer in the field of printed circuits. He consulted for both General Electric Company and Motorola Inc. in the production of printed circuits. His research activities have included vacuum metallurgy, electrodeposition, metallizing non conductors, extractive metallurgy, corrosion, physical metallurgy, studies of physical properties of thin metallic film, semiconductor and rectifier materials.

His educational background is as follows:

Undergraduate: Chemical Engineering, Illinois Institute of Technology.
Graduate: Chemistry, DePaul University; Chemistry, University of Chicago. He has taught applied Electro-Chemistry at Illinois Institute of Technology and various chemistry courses at DePaul University.

S. Majewski - Senior Engineer.-

Mr. Majewski is a graduate of Illinois Institute of Technology.
His previous experience is as follows:
Mechanical Engineer - Belmont Radio Corporation
- 4 years.
Assistant Chief Engineer - Daval Products Corporation
- 5 years.
Plant Superintendent - Candace, Inc.
- 5 years.
Design Engineer - American Phenolic Corporation
- 2 1/2 years.
Mr. Majewski has been with Cinch Manufacturing Company as a Design Engineer for a period of 5 years.
Mr. Majewski's contributions while with Amphenol and Cinch have been entirely in the field of electrical connector design.

H. Dwan - Mechanical Engineer.-

Mr. Dwan is a graduate of the Aeronautical University and holds a degree in Aeronautical Engineering.
Previous to this he attended DePaul University for one year.
His previous experience is as follows:
Andrew Corporation - Junior Design Engineer - 2 years.
While with Andrew Corporation, Mr. Dwan participated in the design of Parabolic Dishes, Cable Connectors and Communications Antennas.

Mr. Dwan has been with Cinch Manufacturing Company 2 1/2 years. His function at Cinch is Design Engineer of Electrical Connectors.

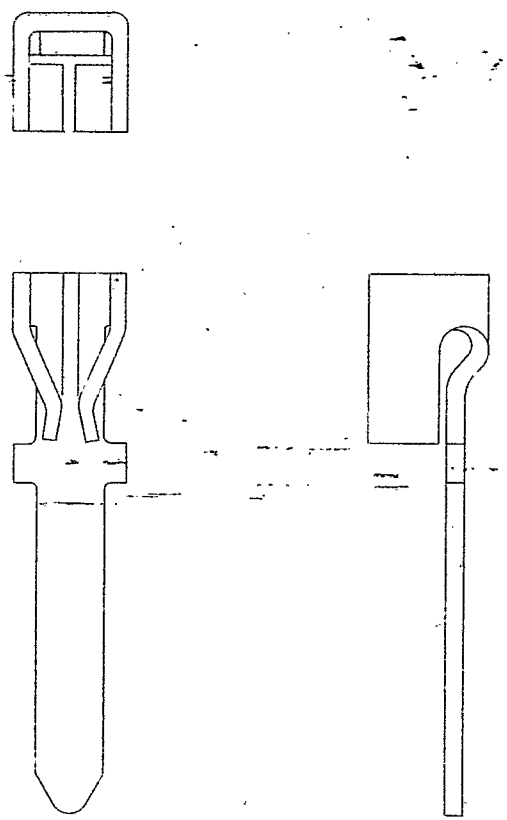


FIGURE 1 — PAGE 17

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART

FIRST USED ON

MATERIAL

FINISH

NAME

CONTACT — .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible].
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER APPROACH A-F

K+E HERCULENE PB163® DRAFTING FILM

TASK A

TABLE 1

SUBJECT: TEST ON CONTACT APPROACH A-2 (PRELIMINARY)

TEST CONDUCTED BY: S. MAJEWSKI

TEST SUBMITTED BY: S. MAJEWSKI

DATE OF TEST: APRIL 16, 1963

CONTACT MATERIAL: PHOSPHOR BRONZE GRADE A HARD

METHOD OF TEST: DROP WEIGHTS: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES)

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

RESULTS:

STEP 1

.016 DIA. PIN

INSERTION	RETENTION
3.5	2.5
3.5	2.0
3.5	1.0
3.0	1.0
3.0	1.0

STEP 2

.018 DIA. PIN

INSERTION	RETENTION
4.0	2.0
4.0	2.0
3.5	2.0
3.0	2.0
3.0	2.0

STEP 3

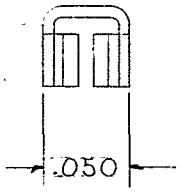
.020 DIA. PIN

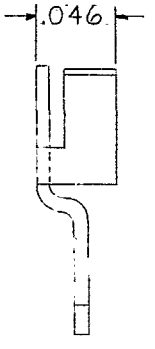
INSERTION	RETENTION
10.5	4.0
10.5	4.0
7.0	3.0
7.0	2.75

STEP 4

.016 DIA. PIN

INSERTION - RETENTION
CONTACT FAILED





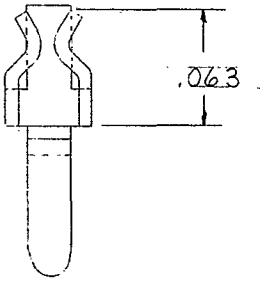


FIGURE 2 — PAGE 19

SIMILAR PART:

FIRST USED ON

MATERIAL: PHOSPHOR BRONZE GRADE A" HARD TEMPER

FINISH

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64, DECIMALS ± .005~~.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. S. MAJEWSKI | DATE

CK. | SCALE 10 to 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-2

TASK A

TABLE 2

SUBJECT: TEST ON CONTACT APPROACH A-2-1 (PRELIMINARY)

TEST CONDUCTED BY: CINCH TEST LAB.

TEST SUBMITTED BY: S. MAJEWSKI

DATE OF TEST: APRIL 30, 1963

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD

METHOD OF TEST: DROP WEIGHTS: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES)

NOTE: ALL FIGURES QUOTED ARE IN OUNCES

STEP 1

(AFTER FIVE SIZINGS WITH .016 DIA. PIN.)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
6.0	2.0	2.0

STEP 2

(AFTER FIVE SIZINGS WITH .018 DIA. PIN)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
9.0	3.0	1.25

STEP 3

(AFTER FIVE SIZINGS WITH .020 DIA. PIN)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
13.0	4.0	0.5

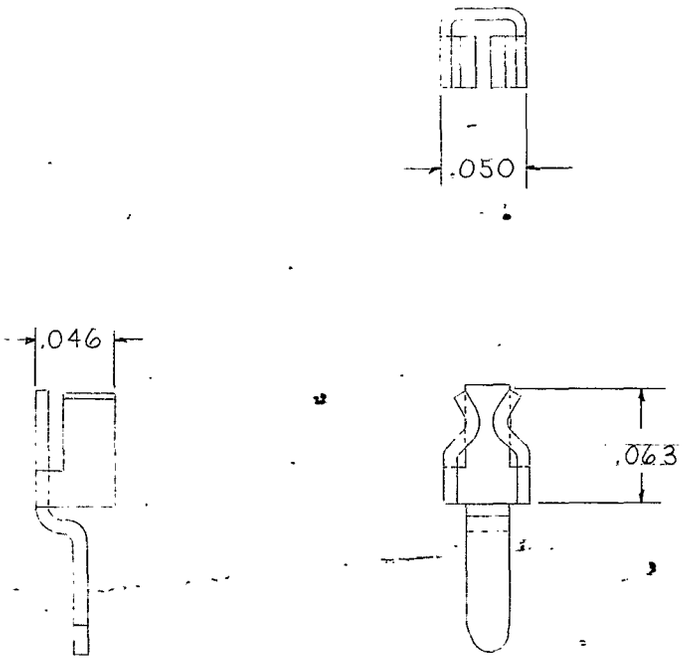


FIGURE 3 — PAGE 21

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64, DECIMALS: ± .005~~.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. S. MAJEWSKI | DATE

CK. | SCALE 10 TO 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-2-1

HE HERCULENE PB163 DRAFTING FILM

TASK A

TABLE 3

SUBJECT: TEST ON CONTACT APPROACH A-2-2 (PRELIMINARY)

TEST CONDUCTED BY: CINCH TEST LAB.

TEST SUBMITTED BY: S. MAJEWSKI

DATE OF TEST: APRIL 30, 1963

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD - HEAT TREATED 700°F for 30 min.

METHOD OF TEST: DROP WEIGHTS: GRADUATED OUNCES WEIGHTS (GRADUATED IN HALF OUNCES)

NOTE: ALL FIGURES QUOTED ARE IN OUNCES

STEP 1

(AFTER FIVE SIZINGS WITH .016 DIA. PIN)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
18.0	5.0	3.5

STEP 2

(AFTER FIVE SIZINGS WITH .018 DIA. PIN)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN.
18.0	6.0	2.5

STEP 3

(AFTER FIVE SIZINGS WITH .020 DIA. PIN)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
20.0	6.0	1.75

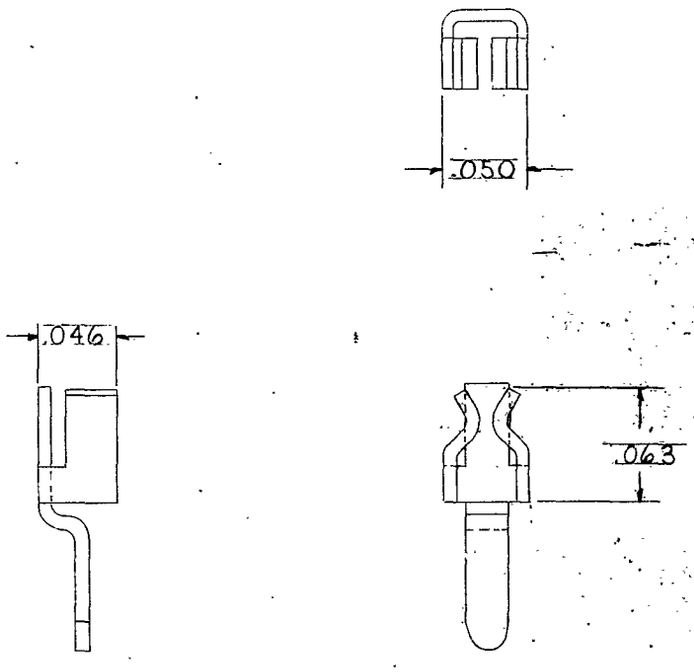


FIGURE 4 — PAGE 23

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25 HEAT TREAT - 700°F. FOR 30 MIN.

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible]
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. S. MAJEWSKI | DATE

CK. | SCALE 10 TO 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
	REVISIONS	

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-2-2

TASK A

TABLE 4

SUBJECT:	TEST ON CONTACT APPROACH A-3 (PRELIMINARY)
TEST CONDUCTED BY:	S. MAJEWSKI
TEST SUBMITTED BY:	S. MAJEWSKI
DATE OF TEST:	MARCH 1, 1963
CONTACT MATERIAL:	PHOSPHOR BRONZE - SPRING TEMPER
METHOD OF TEST:	HUNTER SCALE
NOTE:	ALL FIGURES QUOTED ARE IN OUNCES.

RESULTS:

STEP 1

.020 DIA. PIN

INSERTION	RETENTION
7.0	3.5
5.5	3.0
5.0	3.0
5.5	4.0
5.0	3.5

STEP 2

.016 DIA. PIN

INSERTION	RETENTION
0	0

STEP 3

.017 DIA. PIN

INSERTION	RETENTION
0	0

STEP 4

.018 DIA. PIN

INSERTION	RETENTION
1.5	1.0
1.0	1.0
1.0	0.75
1.5	1.0
1.5	1.25

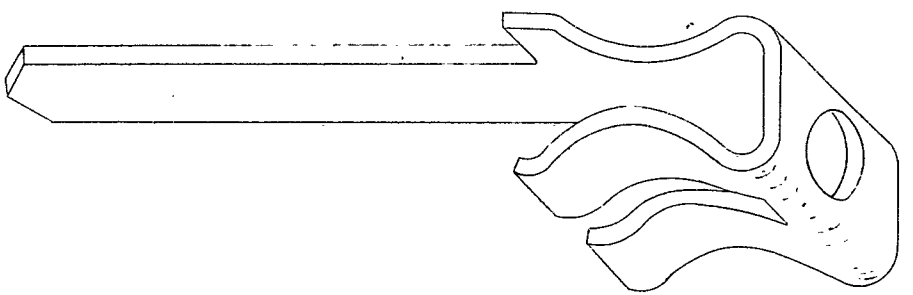


FIGURE 5 - PAGE 25

SIMILAR PART:

FIRST USED ON

MATERIAL
PHOSPHOR BRONZE GRADE "A" SPRING TEMPER

FINISH

NAME
CONTACT .016 - .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64 DECIMALS ± .005~~
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. S. MAJEWSKI
DATE
CK.
SCALE 50 To 1.
APP.
MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER
APPROACH A-3

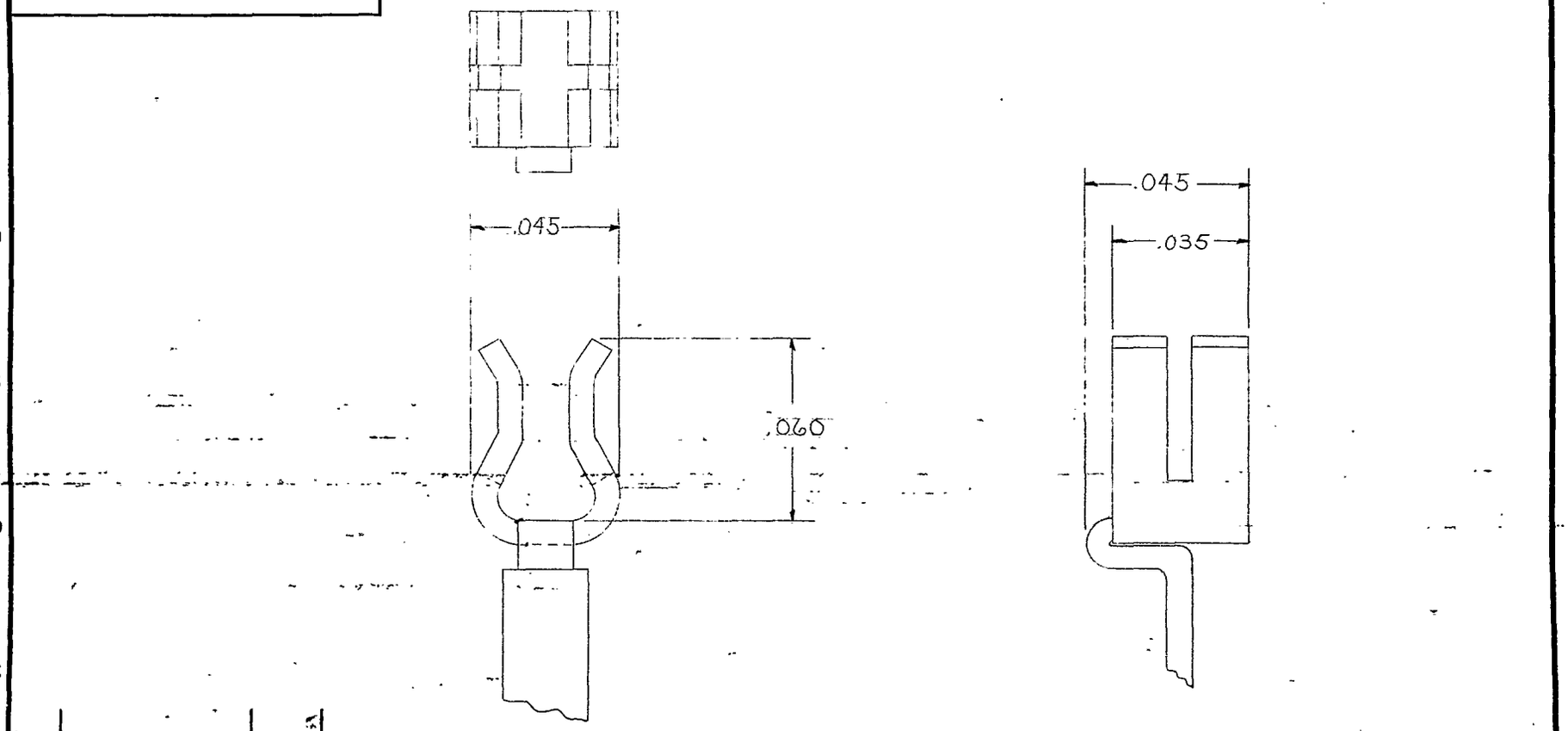


FIGURE 6 — PAGE 26

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: FRACTIONS ± 1/64, DECIMALS ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

CK.

APP.

DATE

SCALE 20 to 1

MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-4

TASK A

TABLE 5

SUBJECT: TEST ON CONTACT APPROACH A-5 (PRELIMINARY)

TEST CONDUCTED BY: H. DWAN

TEST SUBMITTED BY: H. DWAN

DATE OF TEST: APRIL 17, 1963

METHOD OF TEST: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES) USED TO DETERMINE INSERTION AND WITHDRAWAL.

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD.

RESULTS:

STEP 1

.016 DIA. PIN

INSERTION	RETENTION
11.	4.5
10.5	3.5
10.5	4.0
10.5	4.5
9.5	4.0

STEP 2

.018 DIA. PIN

INSERTION	RETENTION
18.5	5.5
16.5	6
14.5	6
14.5	6
14.5	5.5

STEP 3

.020 DIA. PIN

INSERTION	RETENTION
24	12
22.5	10
18.5	11.5
12.5	7.5
12.5	7.5

STEP 4

.016 DIA. PIN

INSERTION - RETENTION

(CONTACT FAILED)

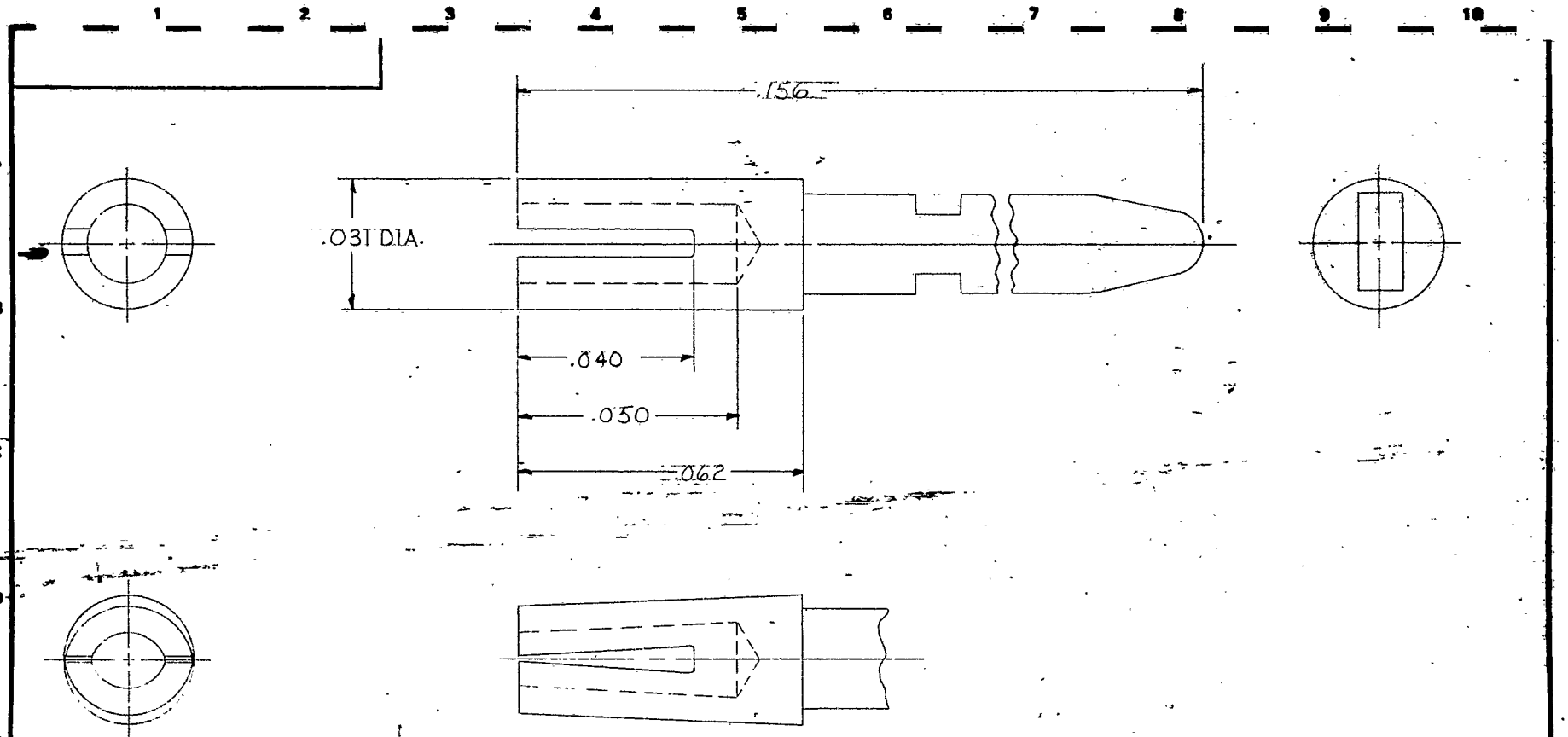


FIGURE 7 — PAGE 28

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25 HALF HARD

FINISH

NAME: CONTACT .016 — .020 DIA PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64, DECIMALS ± .005~~.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

DATE

CK.

SCALE 30 To 1

APP.

MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-5

K&E HERCULENE PB163* DRAFTING FILM

TASK A

TABLE 6

SUBJECT: TEST OF CONTACT APPROACH A-5-1 (PRELIMINARY)

TEST CONDUCTED BY: H. DWAN

TEST SUBMITTED BY: H. DWAN

DATE OF TEST: APRIL 24, 1963

METHOD OF TEST: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES) USED TO DETERMINE INSERTION AND WITHDRAWAL.

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD.

RESULTS:

STEP 1 .016 DIA. PIN		STEP 2 .018 DIA. PIN	
INSERTION	RETENTION	INSERTION	RETENTION
14	6	20	6
12.5	6.5	16	7
12.5	6.5	16	7
12.5	6	16	7
12.5	6	16	7

STEP 3 .020 DIA. PIN		STEP 4 .016 DIA. PIN	
INSERTION	RETENTION	INSERTION	RETENTION
22	10		
20	13		
22	12	(CONTACT FAILED)	
22	12		
21	12		

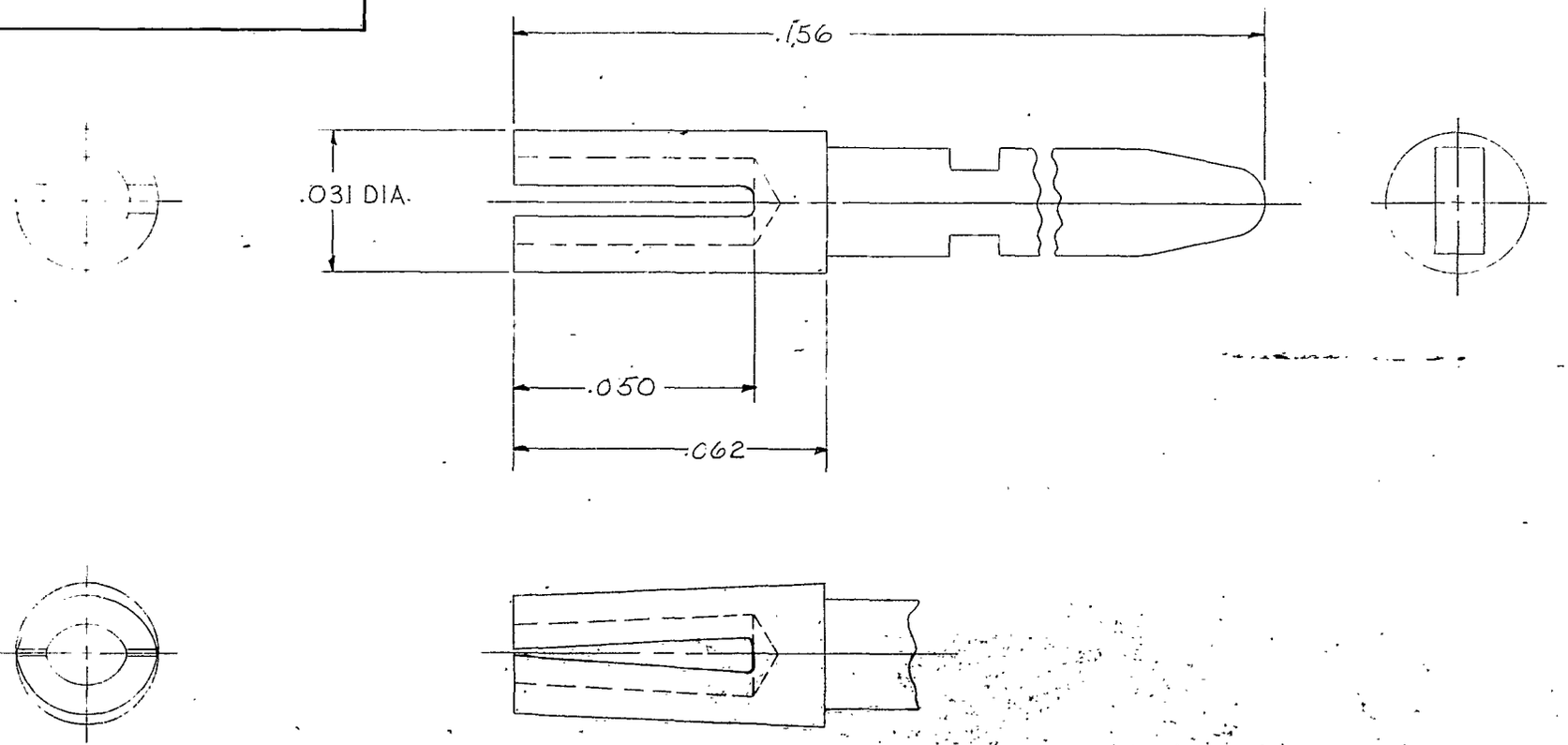


FIGURE 8 — PAGE 30

This restriction does not apply to material submitted under contract No. DA-36-039-AMC 00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25 HALF HARD

FINISH

NAME: CONTACT .016 — .020 DIA PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible] ± 1/64, DECIMALS [illegible]
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED
ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE 30 TO 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-5-1

K-E HERCULENE P8163® DRAFTING FILM.

TASK A

TABLE 7

SUBJECT: TEST ON CONTACT APPROACH A-5-2 (PRELIMINARY)

TEST CONDUCTED BY: H. DWAN

TEST SUBMITTED BY: H. DWAN

DATE OF TEST: APRIL 24, 1963

METHOD OF TEST: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES). USED TO DETERMINE INSERTION AND WITHDRAWAL.

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD - HEAT TREATED 700°F FOR 30 MINUTES.

RESULTS:

STEP 1	
.016 DIA. PIN	
INSERTION	RETENTION
3	1
2.5	1
2.5	1
3	1.5
2.5	1

STEP 2	
.018 DIA. PIN	
INSERTION	RETENTION
5	4
5	4
4	4

STEP 3	
.020 DIA. PIN	
INSERTION	RETENTION
6	4
5	2
5	2

STEP 4	
.016 DIA. PIN	
INSERTION	RETENTION
(CONTACT FAILED)	

NOTE: As noted above in Step Two (2) only three (3) insertion and withdrawal attempts were made. As the third (3rd) insertion and a close examination of the contact was made, it was noted that the contact was starting to take a set. With this condition eminent Step Three (3) was started. As evidenced in the above figures and by examination of the contact after three (3) insertion and withdrawals with the .020 Dia. Pin, a permanent set resulted.

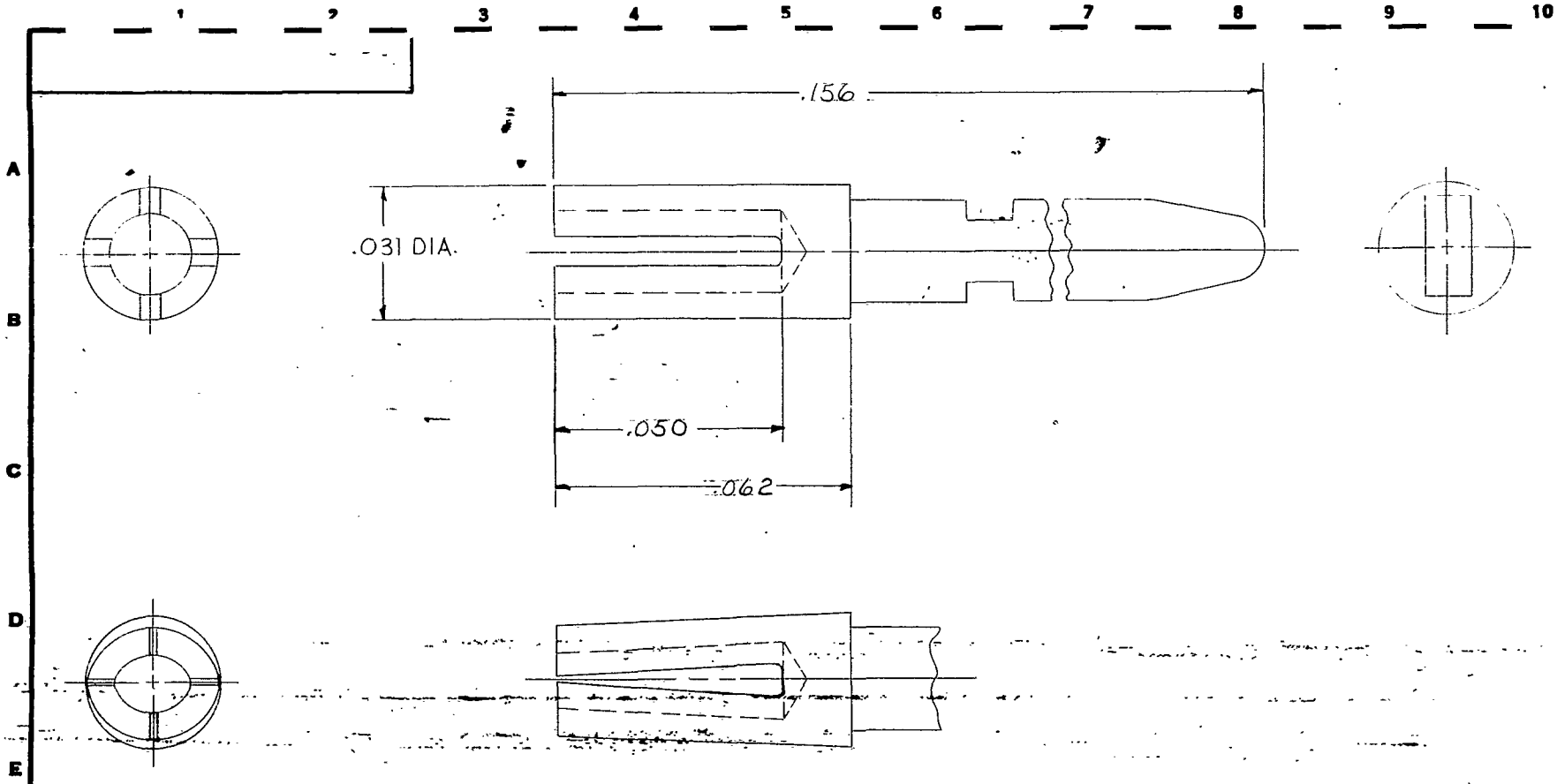


FIGURE 9 PAGE 82

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122(E).

SIMILAR PART:

FIRST USED ON

MATERIAL: BERY. COPPER ALLOY 25 HALF HARD. HEAT TREAT 700° F FOR 30 MIN.

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible] ± .005.
HOLE DIA. ± .005 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

CK.

APP.

DATE

SCALE 3.0 TO 1

MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE

REVISIONS

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-3-2

TASK A

TABLE 8

SUBJECT:	TEST ON CONTACT APPROACH A-5-3 (PRELIMINARY)
TEST CONDUCTED BY:	CINCH TEST LAB.
TEST SUBMITTED BY:	H. DWAN
DATE OF TEST:	MAY 5, 1963
CONTACT MATERIAL:	BERYLLIUM COPPER ALLOY 25 - HALF HARD - HEAT TREATED 700°F FOR 30 MINUTES.
METHOD OF TEST:	HUNTER SCALE & STANDARD OUNCE WEIGHTS.
NOTE:	ALL FIGURES QUOTED ARE IN OUNCES.

STEP 1

(AFTER FIVE SIZINGS WITH .016 DIA. PIN)
(BY WEIGHTS)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
5.0	2.0	1.5

STEP 2

(AFTER FIVE SIZINGS WITH .018 DIA. PIN)
(BY WEIGHTS)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN.
9.0	2.5	1.25

STEP 3

(AFTER FIVE SIZINGS WITH .020 DIA. PIN)
(BY WEIGHTS)

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
12.0	5.0	1.25

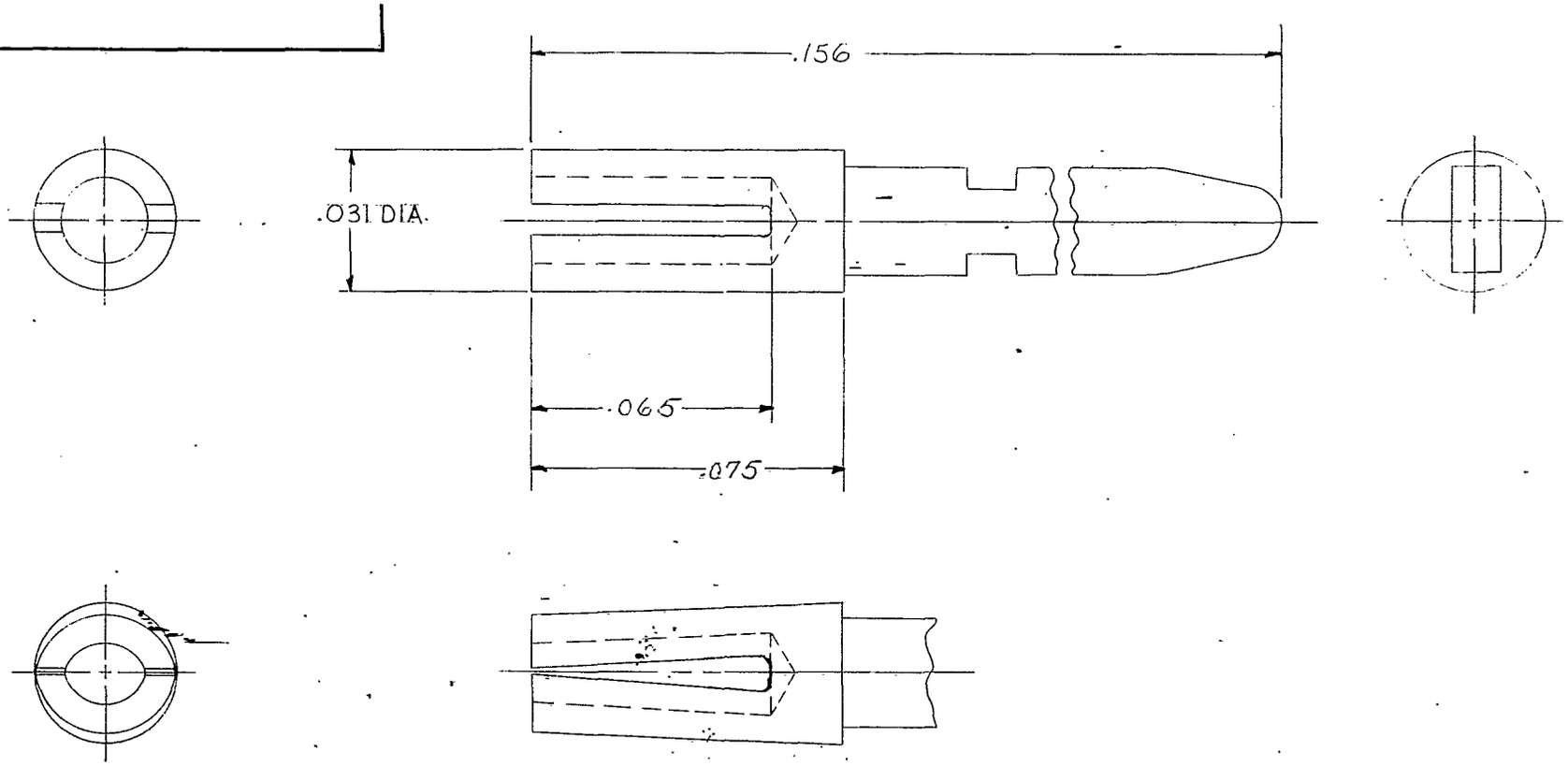


FIGURE 10 - PAGE 34

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL: BERY. COPPER ALLOY 25 HALF HARD HEAT TREAT 700°F FOR 30 MIN.

FINISH

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64, DECIMALS ± .005~~.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

DATE

CK.

SCALE 30 TO 1

APP.

MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-5 3

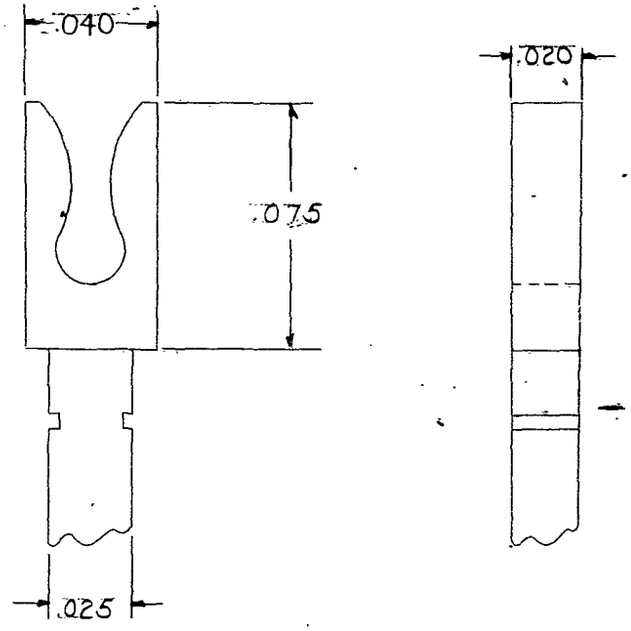


FIGURE 11 — PAGE 35

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL: PHOSPHOR BRONZE GRADE "A" HARD

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible]
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. S. MAJEWSKI | DATE

CK. | SCALE 20 TO 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-6

TASK A

TABLE 9

SUBJECT: TEST ON CONTACT APPROACH A-7 (PRELIMINARY)

TEST CONDUCTED BY: CINCH TEST LAB.

TEST SUBMITTED BY: S. MAJEWSKI

DATE OF TEST: APRIL 19, 1963

CONTACT MATERIAL: PHOSPHOR BRONZE GRAD A HARD

METHOD OF TEST: DROP WEIGHTS: GRADUATED OUNCE WEIGHTS (GRADUATED IN HALF OUNCES & GRADUATED IN GRAMS)

NOTE: ALL FIGURES QUOTED IN OUNCES, UNLESS OTHERWISE STIPULATED.

RESULTS:

STEP 1

.016 DIA. PIN

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
11.0	2.25	
11.0	2.25	
7.0	2.25	
6.0	2.25	
6.0	2.0	20 GRAMS

STEP 2

.018 DIA. PIN

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
26.0	10.0	
26.0	9.0	
24.0	8.0	
20.0	6.0	
22.0	7.0	5 GRAMS

STEP 3

.020 DIA. PIN

INSERTION	WITHDRAWAL	RETENTION WITH .016 DIA. PIN
24.0	6.0	
18.0	6.0	
16.0	6.0	CONTACT FAILED
15.0	5.0	
15.0	5.0	

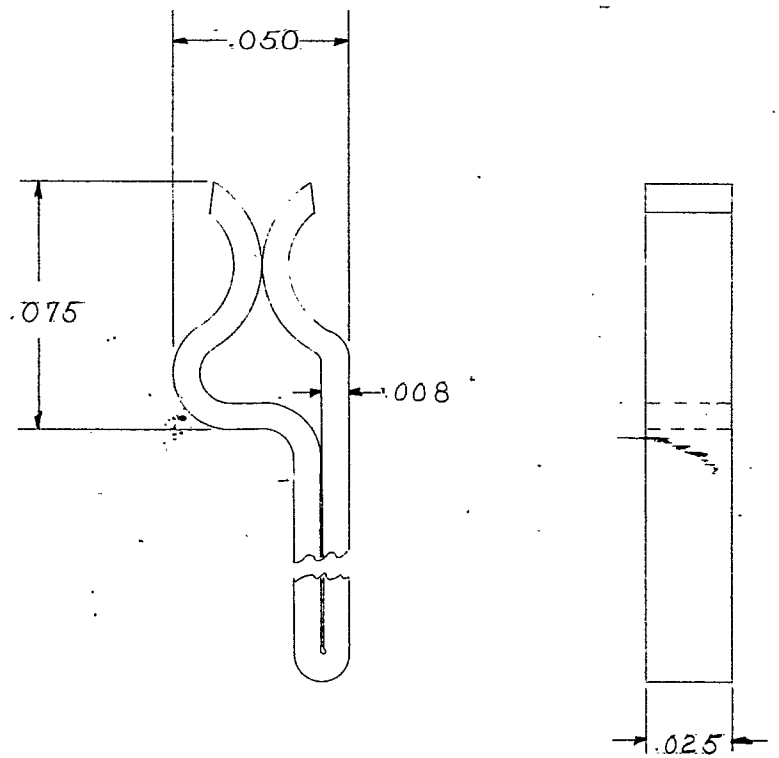


FIGURE 12 — PAGE 37

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL
— PHOSPHOR BRONZE GRADE "A" HARD TEMPER

FINISH

NAME
CONTACT .016 .020 DIA. PIN

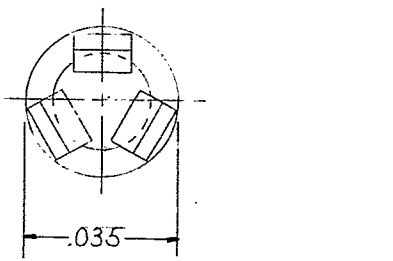
TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [illegible] ± .003.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

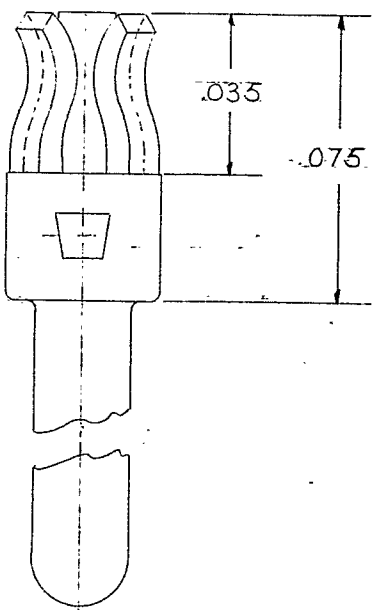
DR. S. MAJEWSKI | DATE
CK. | SCALE 20 TO 1
APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER
APPROACH A-7





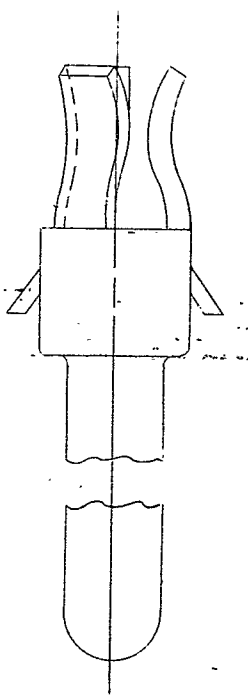


FIGURE 13 — PAGE 38

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [redacted] ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE 2.5 TO 1

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-8

TASK A
TABLE 10

SUBJECT: TEST ON CONTACT APPROACH A-9

TEST CONDUCTED BY: H. DWAN

TEST SUBMITTED BY: H. DWAN

DATE OF TEST: APRIL 2, 1963

METHOD OF TEST: GRADUATED OUNCE WEIGHTS. (GRADUATED IN HALF OUNCES) USED TO DETERMINE INSERTION AND WITHDRAWAL.

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD

RESULTS:

STEP 1

.016 DIA. PIN

INSERTION	RETENTION
3.	2
3	2
3.5	2
3.5	2
3.5	2

STEP 2

.018 DIA. PIN

INSERTION	RETENTION
3	1.5
3.5	2
3	1.5
3.5	1.5
3.5	1.5

STEP 3

.020 DIA. PIN

INSERTION	RETENTION
5	2.5
4.5	2.5
5	2.5
5	2
5	3

STEP 4

.016 DIA. PIN

INSERTION	RETENTION
2.5	2
3	1.5
2.5	1.5
2.5	2
3	2

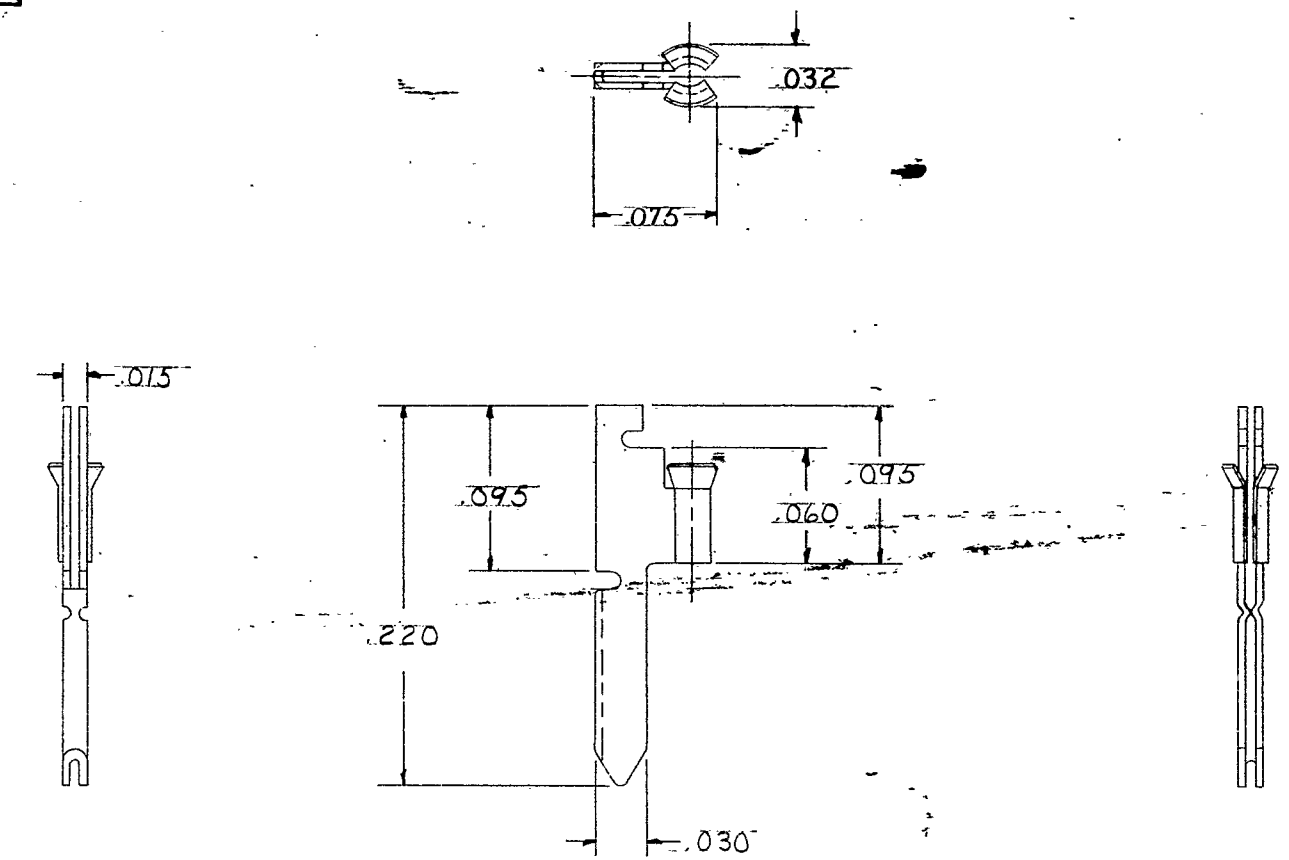


FIGURE 14 - PAGE 40

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 - .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [redacted],
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED
ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

DATE

CK.

SCALE 10 TO 1

APP.

MUST MEET CINCH PERFORMANCE SPEC. NO.

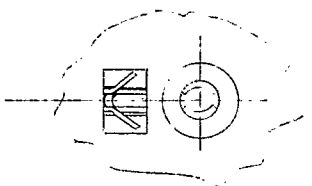
SYM	WAS	DATE

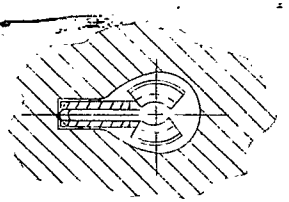
REVISIONS

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS

DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-9





SECTION A-A

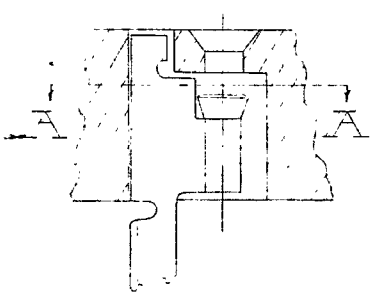


FIGURE 15 - PAGE 41

SIMILAR PART:

FIRST USED ON

MATERIAL

FINISH

NAME

CONTACT IN INSULATOR

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: FRACTIONS ± 1/64. DECIMALS. ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

DATE

CK.

SCALE

APP.

MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE

REVISIONS

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS

DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER

APPROACH A-9

TASK A

TABLE 11

SUBJECT: TEST ON CONTACT APPROACH A-9-1 (MMODIFIED AS NOTED BELOW).

TEST CONDUCTED BY: H. DWAN

TEST SUBMITTED BY: H. DWAN

DATE OF TEST: APRIL 2, 1963

METHOD OF TEST: GRADUATED OUNCE WEIGHTS, (GRADUATED IN HALF OUNCES) USED TO DETERMINE INSERTION AND WITHDRAWAL.

NOTE: ALL FIGURES QUOTED ARE IN OUNCES.

CONTACT MATERIAL: BERYLLIUM COPPER ALLOY 25 - HALF HARD.

RESULTS:

STEP 1

.016 DIA. PIN

INSERTION	RETENTION
5	3.5
5	3.5
6	3.5
5.5	3.5
5	3

STEP 2

.018 DIA. PIN

INSERTION	RETENTION
6	3
7	3
6	2.5
5	3
6	3

STEP 3

.020 DIA. PIN

INSERTION	RETENTION
8.5	6
9	6
9	5.5
8	5.5
9	5.5

STEP 4

.016 DIA. PIN

INSERTION	RETENTION
4.5	3
4	3.5
4.5	3
4	3
4	2.5

NOTE: This contact is similar to A-9 except that it is not cut part way down at the fold.

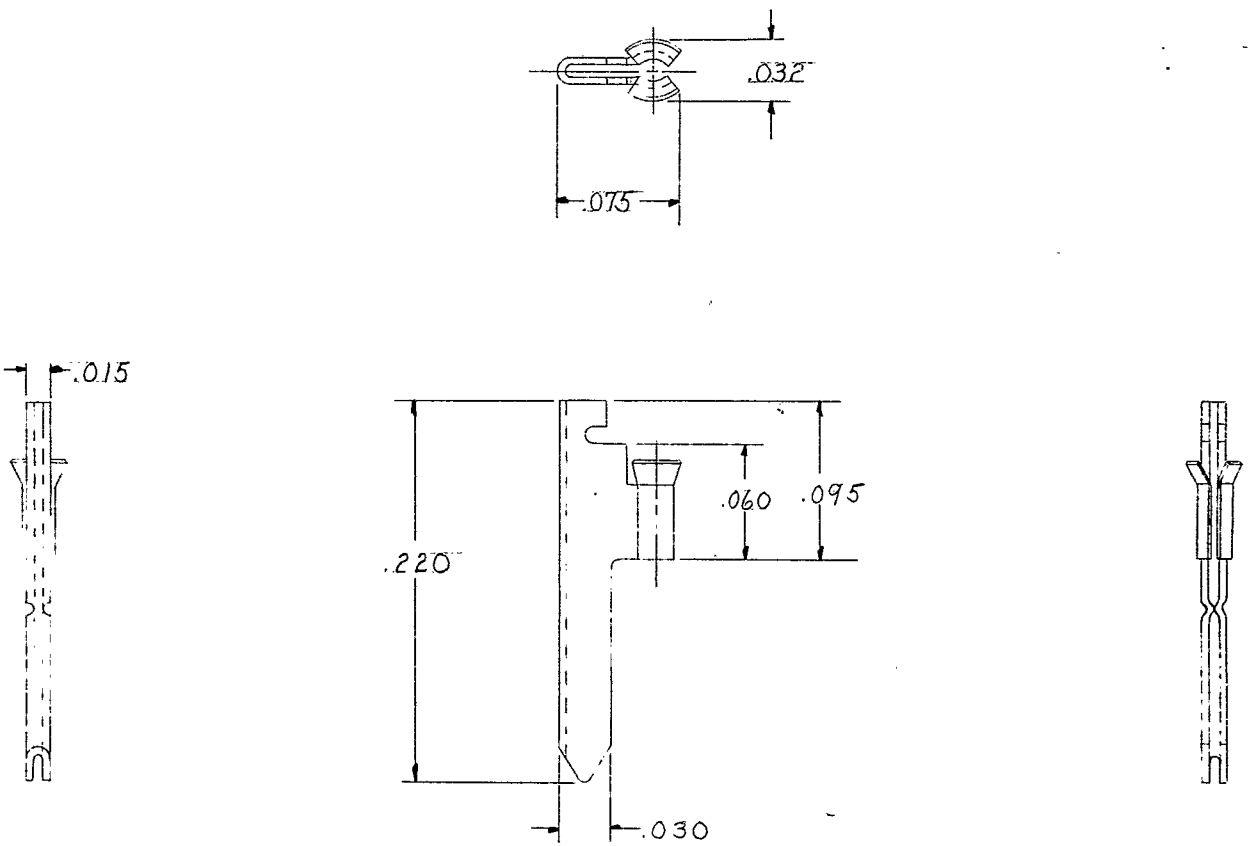


FIGURE 16 - PAGE 43

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 - .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES. UNLESS OTHERWISE SPECIFIED.
TOLERANCES: ~~FRACTIONS ± 1/64, DECIMALS ± .005~~.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN

DATE

CK.

SCALE 10 TO 1

APP.

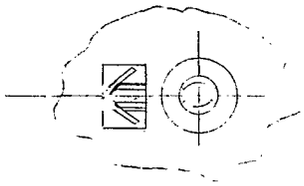
MUST MEET CINCH PERFORMANCE SPEC. NO.

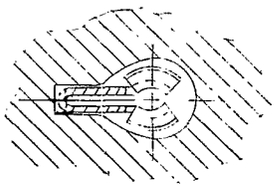
SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-9-1

K+E HERCULENE PB163 DRAFTING FILM





SECTION A-A

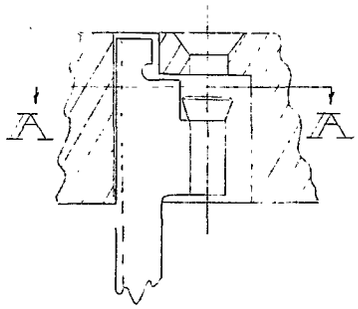


FIGURE 17 - PAGE 44

SIMILAR PART:

FIRST USED ON

MATERIAL

FINISH

NAME

CONTACT IN INSULATOR

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: FRACTIONS ± 1/64. DECIMALS. ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER

APPROACH A-9-1

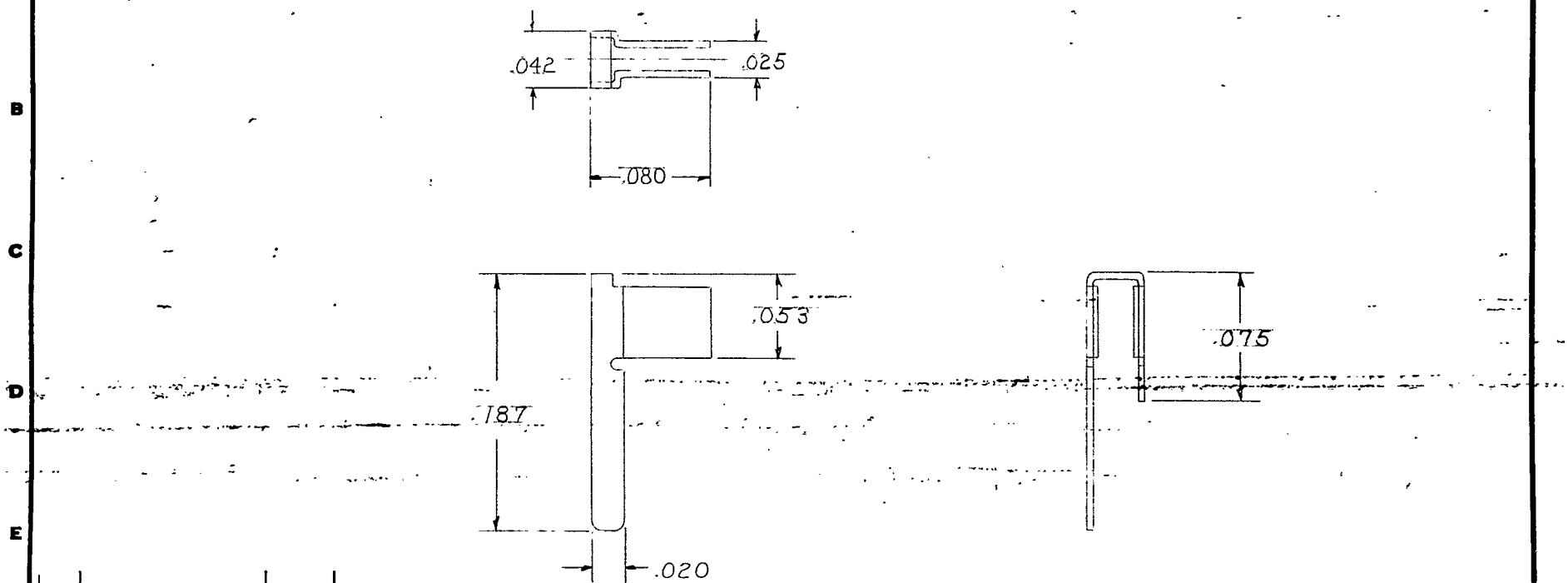


FIGURE 18 - PAGE 45

SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 - .020 DIA. PIN

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [redacted].
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE 10 TO 1

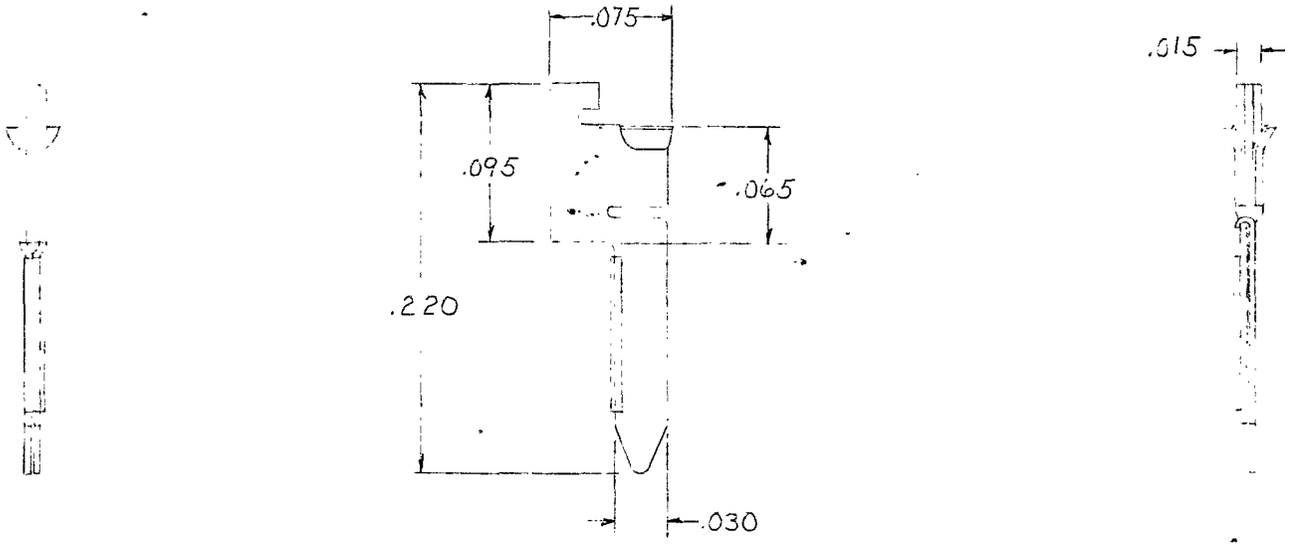
APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-10

K&E HERCULENE PB103 DRAFTING FILM



SIMILAR PART:

FIRST USED ON

MATERIAL: BERYLLIUM COPPER ALLOY 25

FINISH:

NAME: CONTACT .016 — .020 DIA. PIN

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: [redacted] ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. H. DWAN | DATE

CK. | SCALE 10 TO 1

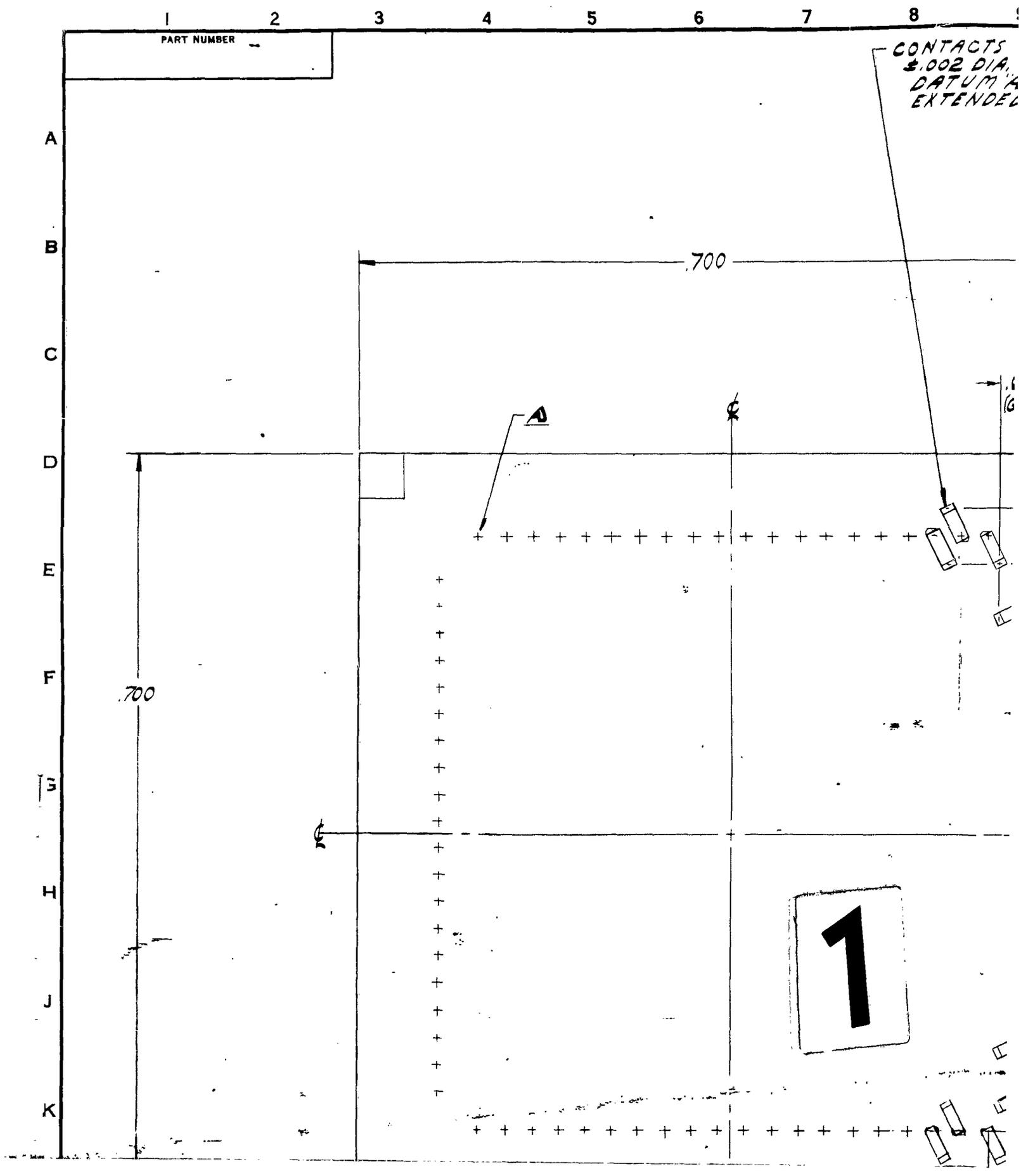
APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER: APPROACH A-11

FIGURE 19 — PAGE 46


1 2 3 4 5 6 7 8
A B C D E F G H J K
PART NUMBER
CONTACTS
.700
.700
A
1

CONTACTS SPACED .025 ℄ LOCATED WITHIN ℄.002 DIA. OF TRUE POSITION IN RELATION TO DATUM "A" WITH ALL CONTACTS TAILS CENTERS, EXTENDED ON A .050 GRID.

80~# CONTACTS

2

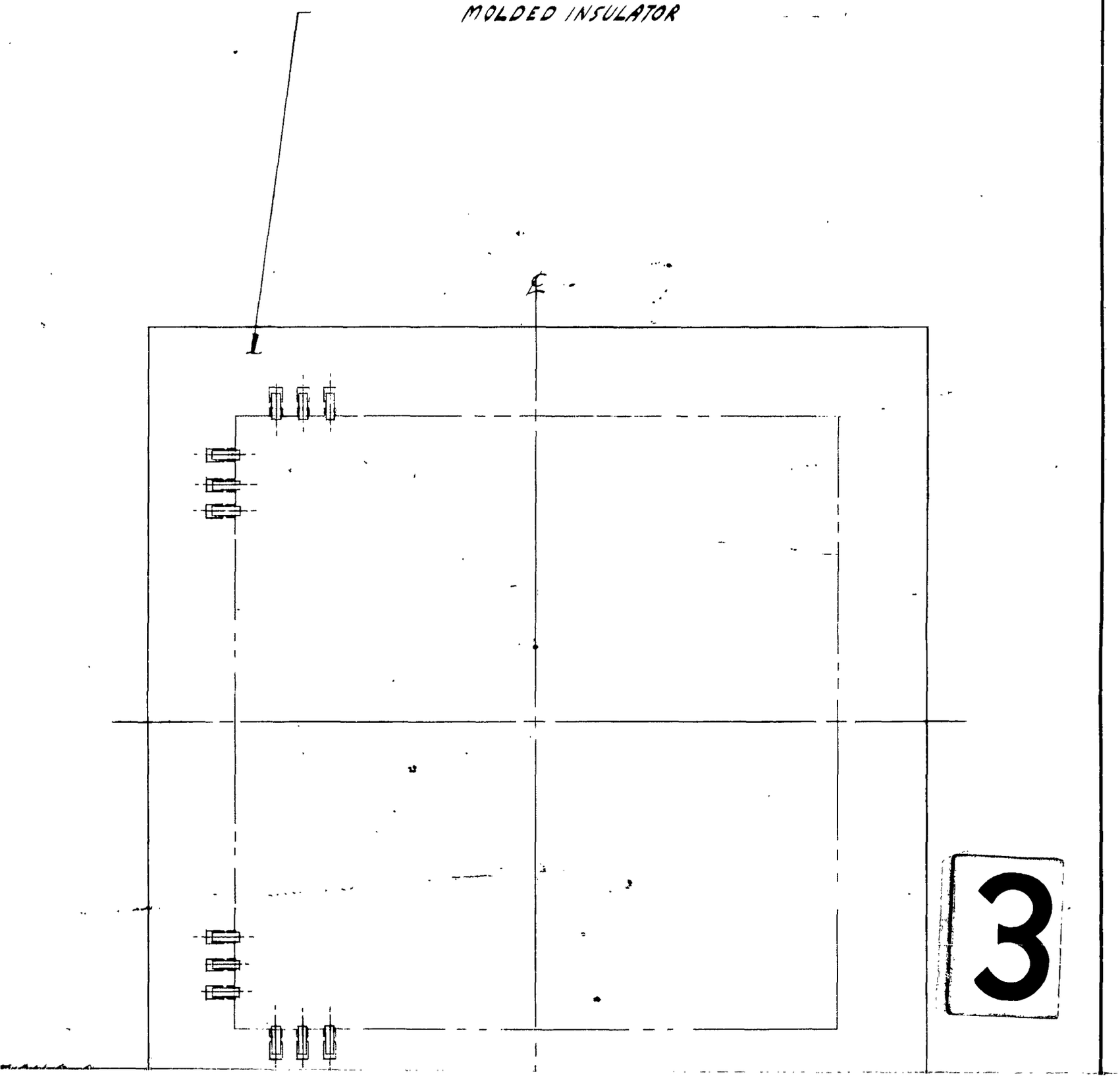
.100

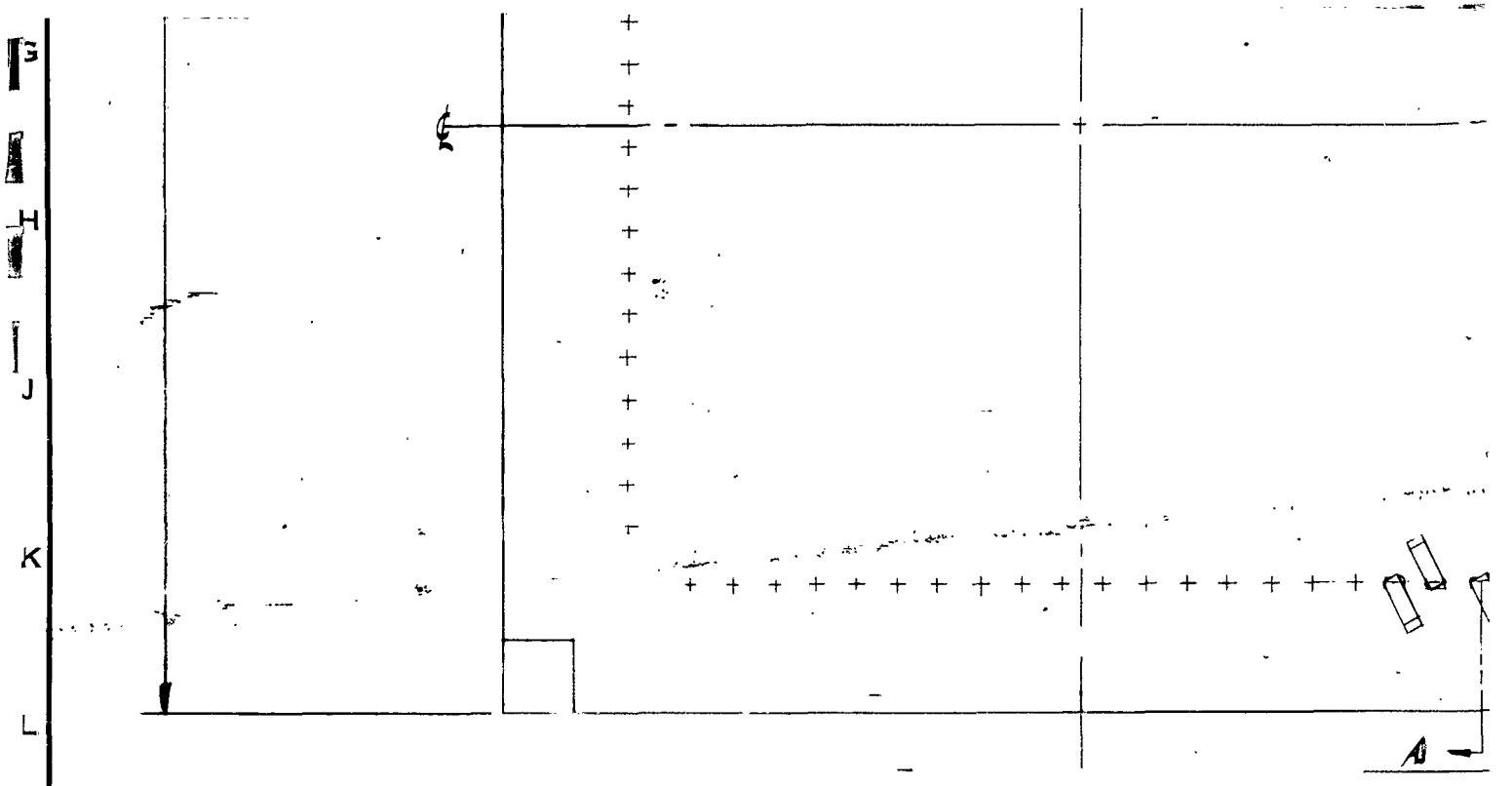
.050 (GRID)

.050 (GRID)

A

A


MOLDED INSULATOR
1
3



REAR VIEW

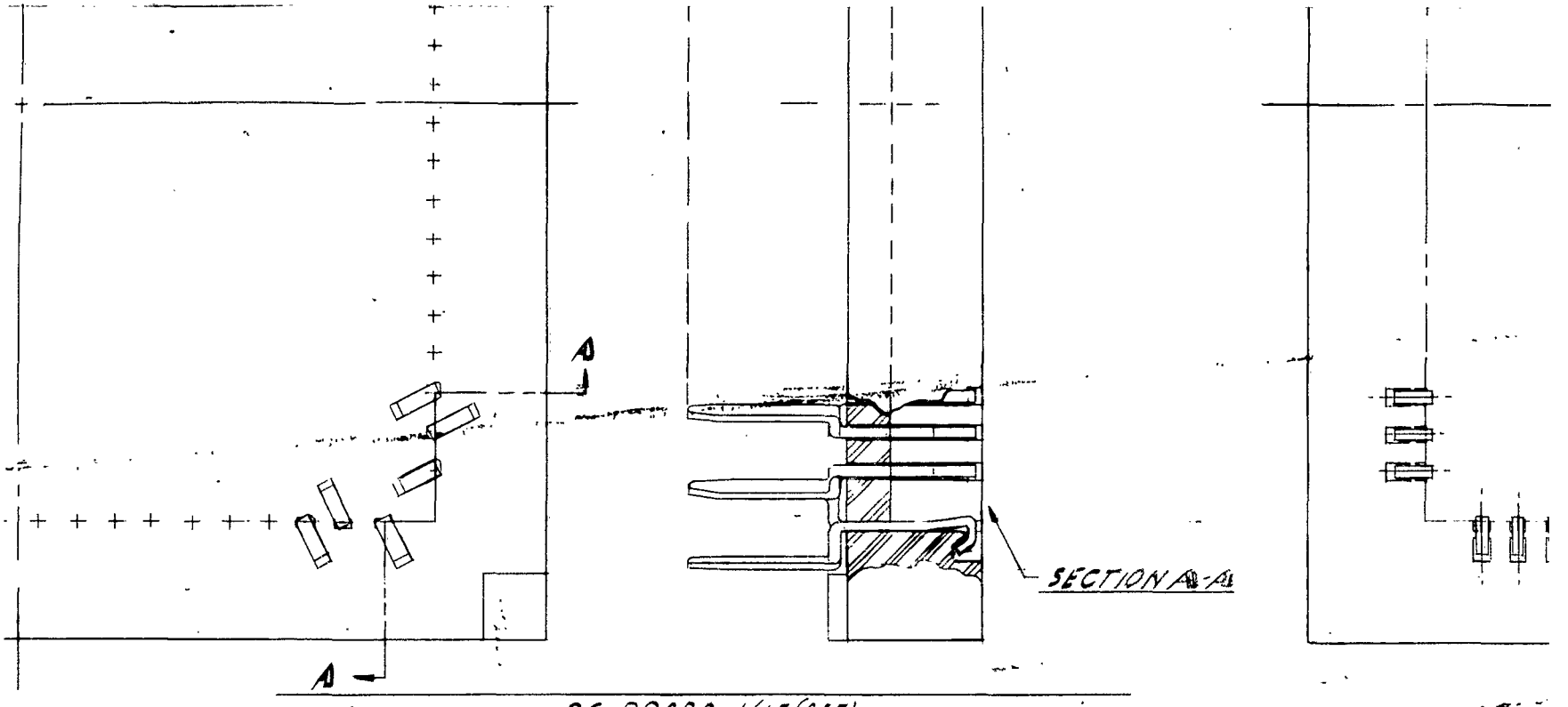
NOTE:
THE FRONT & REAR VIEWS ARE BILATERALLY SYMMETRICAL.

.015

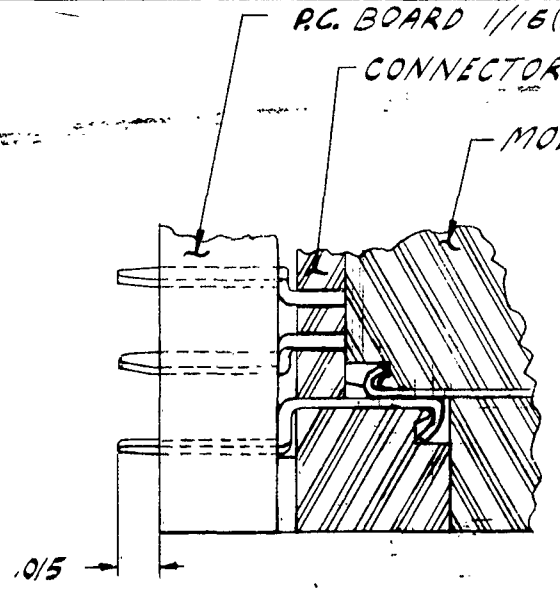
SIMILAR PART:

REVISIONS	SYM.	WAS	DATE

4



R VIEW

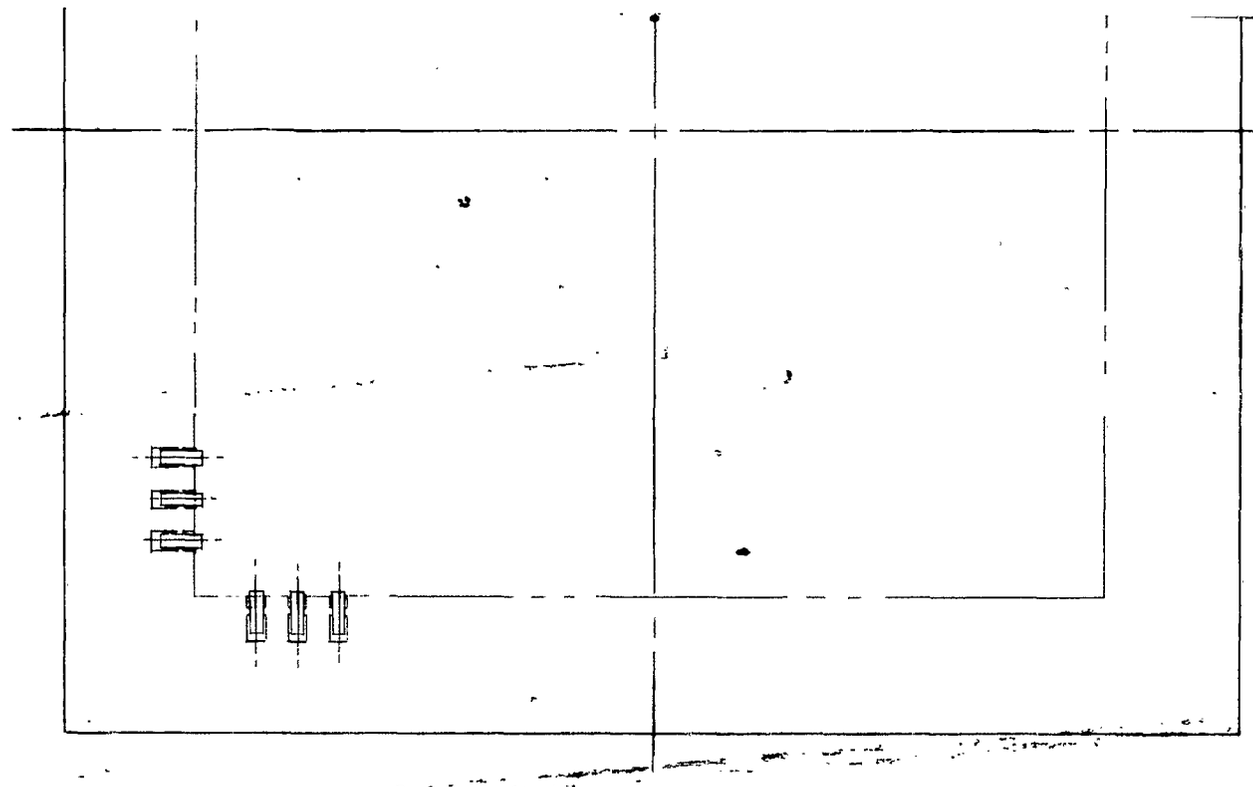


DETAIL

MATERI

FINISH

TOLERA



ON A8-A5

FRONT VIEW

6

FIRST USED ON

MATERIAL	NAME MICRO - PRINTED CIRCUIT - MODULE CONNECTOR.	
FINISH	DR. W. Aumann	DATE 10/16/62
TOLERANCES: ALL DIMENSIONS IN INCHES UNLESS OTHERWISE SPECIFIED. TOLERANCES: FRACTIONS ± 1/64, DECIMALS, ± .005. HOLE DIA. ± .003, UNLESS OTHERWISE SPECIFIED. ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED. ON GIVEN ANGLES AND 90° CENTERLINES. DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.	CK.	SCALE 10:1
	APP.	MUST MEET CINCH PERFORMANCE SPEC. NO.

CINCH MANUFACTURING COMPANY
CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER APPROACH-B1

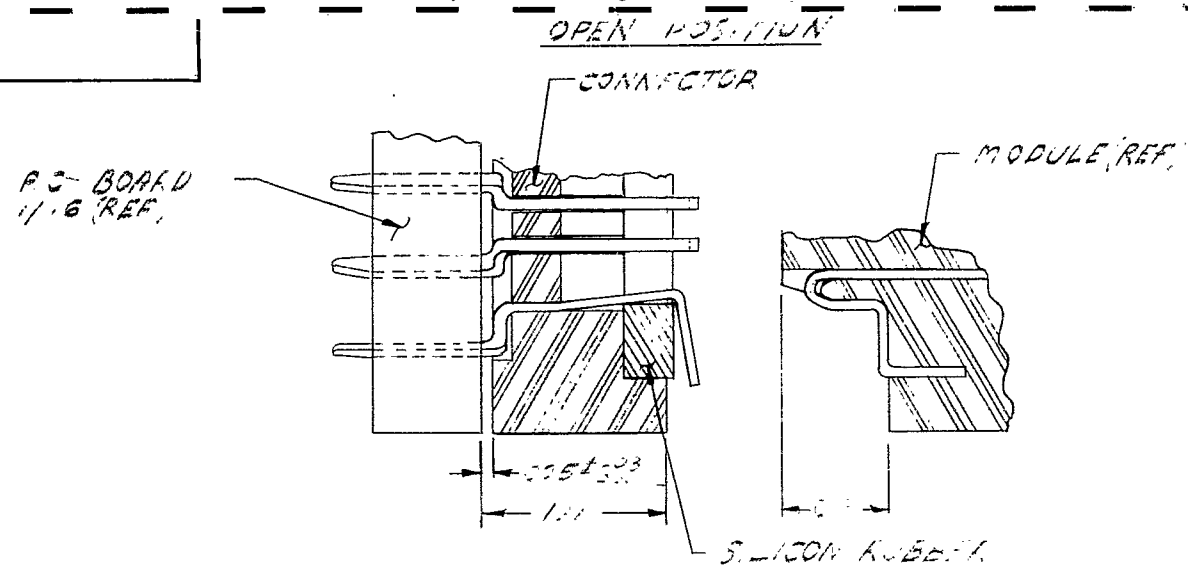


FIGURE 2 - PAGE 48

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL	NAME DETAIL OF CONTACT MODULE
FINISH	

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: FRACTIONS ± 1/64, DECIMALS, ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED
ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR.	DATE 10-17-62
CK.	SCALE 10:1
APP.	MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE
REVISIONS		

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS
DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER
APPROACH-B2

FIGURE 22 - PAGE 49

This restriction does not apply to material submitted under contract No. DA-36-039-AMC-00122 (E)

SIMILAR PART:

FIRST USED ON

MATERIAL

NAME

FINISH

TOLERANCES:
ALL DIMENSIONS IN INCHES, UNLESS OTHERWISE SPECIFIED.
TOLERANCES: FRACTIONS ± 1/64. DECIMALS, ± .005.
HOLE DIA. ± .003 UNLESS OTHERWISE SPECIFIED.
ALL ANGULAR TOLERANCES ± 1/2° UNLESS OTHERWISE SPECIFIED
ON GIVEN ANGLES AND 90° CENTERLINES.
DO NOT SCALE DRAWING. WORK TO DIMENSIONS ONLY.

DR. | DATE

CK. | SCALE

APP. | MUST MEET CINCH PERFORMANCE SPEC. NO.

SYM	WAS	DATE

REVISIONS

CINCH MANUFACTURING COMPANY, CHICAGO, ILLINOIS

DIVISION OF UNITED-CARR FASTENER CORPORATION

PART NUMBER

APPROACH - B3

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Commanding Officer and Director U.S. Navy Electronics Laboratory San Diego 52, California	1
Commanding Officer USAELRDL Fort Monmouth, N. J. ATTN: SELRA/PEP (Lanc)	33

CINCH MFG. COMPANY
DIVISION OF U.I. - CARR FASTENER CORPORATION
CHICAGO, ILLINOIS

PRINTED CIRCUIT CONNECTORS FOR MICROASSEMBLIES

HOWARD E. DWAN

First quarterly progress report. 1 February 1963 to 1 May 1963, 47 pp - inc text - Illus.; USAELRDL Contract No. DA-36-039-AMC-00122(E) Unclassified Report.

TASK A - (20 Contact Microassembly Receptacle)

During this period design effort was concentrated on a total of eleven (11) contact approaches to mate with 0.016" to 0.020" diameter microassembly pins. The contact designs were studied analytically and hand-made contacts of the most promising designs were fabricated and tested with regard to their retention characteristics. Six of the eleven contact designs were selected for further analysis.

TASK B - (Encapsulated Microassembly Connector)

Analytical analyses of three connector design approaches for the 36 and 80 conductor encapsulated microassemblies were made during this period.

UNCLASSIFIED

CINCH MFG. COMPANY
DIVISION OF UNITED - CARR FASTENER CORPORATION
CHICAGO, ILLINOIS

PRINTED CIRCUIT CONNECTORS FOR MICROASSEMBLIES

HOWARD E. DWAN

First quarterly progress report. 1 February 1963 to 1 May 1963, 47 pp - inc text - Illus.; USAELRDL Contract No. DA-36-039-AMC-00122(E) Unclassified Report.

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UNCLASSIFIED

CINCH MANUFACTURING COMPANY
DIVISION OF UNITED - CARR FASTENER CORPORATION
CHICAGO, ILLINOIS

PRINTED CIRCUIT CONNECTORS FOR MICROASSEMBLIES

HOWARD E. DWAN

First quarterly progress report. 1 February 1963 to 1 May 1963, 47 pp - inc text - Illus.; USAELRDL Contract No. DA-36-039-AMC-00122(E) Unclassified Report.

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UNCLASSIFIED

CINCH MANUFACTURING COMPANY
DIVISION OF UNITED - CARR FASTENER CORPORATION
CHICAGO, ILLINOIS

PRINTED CIRCUIT CONNECTORS FOR MICROASSEMBLIES

HOWARD E. DWAN

First quarterly progress report. 1 February 1963 to 1 May 1963, 47 pp - inc text - Illus.; USAELRDL Contract No. DA-36-039-AMC-00122(E) Unclassified Report.

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